

FLIGHT

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AIRCRAFT ENGINEER
AND AIRSHIPS

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Founder and Editor: STANLEY SPOONER

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EDITORIAL COMMENT



THE special article which we publish in the Supplement to this issue, dealing with the Royal Air Force Display, lays stress on one particular point, namely, that in a war where the pilots on both sides are approximately equal in skill and courage, victory in the air will incline to the side which has the best aircraft designers, and, it may be added, an industry which is capable of turning out the latest designs in sufficient numbers in a very short time. The writer has illustrated his point by a sketch, necessarily brief when the magnitude of the subject is considered, of the development of the fighter aeroplane in the great war. While there was little to choose between the two von Richthofens and Mannock, Ball and Barker, the real struggle for supremacy in the air was fought out between Antony Fokker and the German designers, on one side, and Geoffrey de Havilland, T. O. M. Sopwith, F. S. Barnwell and the Farnborough designers (to mention but a few), on the other.

This emphasis on the fighter aeroplane does not imply any slight upon the bomber and reconnaissance machines. The Army could not get the best information about the enemy's dispositions if the machines which took photographs were not designed and equipped to be up to the work required of them. Likewise, the design of a bomber is a problem in which finality is never reached. A bomber requires range, the ability to lift a heavy load of bombs, and the capacity to ward off attacks by hostile fighters. Speed is a desirable quality in a bomber as in all other types of aircraft. A designer cannot give any one machine the maximum of all these qualities. A compromise is always necessary, and only practice in war or on manoeuvres can give a decision as to which machine embodies the most useful compromise for a given purpose. The special aeroplane for army co-operation requires, perhaps, a greater variety of qualities than any other.

During the war these problems came to light, and our designers began to discover the way in which they should be solved. But, during the war, at

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1931

June 26. Aviation Day, Rochester Historical Pageant.
June 26. A.I.D. Test House Inspection, Kidbrooke.
June 26. R.A.F. Dinner Club Annual Dinner, Connaught Rooms.
June 27. Royal Air Force Display, Hendon.
June 28. Herts & Essex Gliding Club Air Display at Spelbrooke Bishop's Stortford.
July 4. T.M.A.C., 3rd Wing, Inaugural Meeting, Stag Lane Aerodrome.
July 4-5. Norfolk and Norwich Ae.C. At Home, Mousehold Aerodrome.
July 4-6-7. Cricket. R.A.F. v. Army at the Oval.
July 10-19. Circuit of Italy.
July 15-16. Cricket. R.A.F. v. Civil Service at Uxbridge.
July 18. Ramsgate Air Rally.
July 18. Lincolnshire Ae.C. Air Pageant, Cleethorpes.
July 22. Household Brigade Flying Club Meeting, Heston.
July 25. King's Cup Race.
July 25-30. Conference on Medical Utility of Aviation in the Colonies, at International Colonial Exhibition, Paris.
July 25-Aug. 9. Rhon Gliding Competitions, Germany.
July 27-28. Cricket. R.A.F. v. Free Foresters at Camberley.
Aug. 1-2-3. Southdown Skysailing Club's Annual Flying Meeting.
Aug. 3-4. Cricket. R.A.F. v. R.N. at Halton.
Aug. 15. Scarborough Ae.C. Air Pageant.
Aug. 15. Manchester-Liverpool Inter-City Race.
Aug. 22. Newcastle-on-Tyne Meeting.
Sept. 5. Norfolk and Norwich Ae.C. Display at Yarmouth.
Sept. 5. Haldon Flying Meeting.
Sept. 12. Schneider Trophy Contest.
Sept. 26. Garden Party, Bristol and Wessex Ae.C.

any rate, no air operation was possible (without undue loss) unless the fighters could hold their own against those of the enemy. There were periods in the war when the Germans, first through the Fokker monoplane and afterwards through the Albatros and the Halberstadt, had the better of us. During those periods our bombers and reconnaissance machines continued to cross the lines with undaunted resolution. Our fighters did their best to protect them, and never hesitated to attack the German fighters, though they well knew that the fight was unequal. In this way the Army staff continued to get reports and photographs of the enemy positions. But it was at a frightful cost, all the more frightful because our pilots and observers risked, and frequently underwent, not only death, but death in a burning aeroplane. So the production of new and better fighters became a matter of the first urgency, and the arrival at the front of the Sopwith "Camel" and the Bristol Fighter was hailed with joy and relief by the men who had been so heroically flying inferior machines.

The bearing of all this upon the Hendon Display of this year is not far to seek. The programme this year, more than in several recent years, shows a great deal of the progress in design which has been made. Two years ago one fighter squadron had just received the "Bulldog," but this is the first Display at which the Bulldog has been allowed to show its quality to any considerable extent. This year we are to see a whole Wing, comprising three squadrons, flying Bulldogs. This is ample amends for previous tardiness in introducing this fine fighter aeroplane to the notice of the public. Still more creditable to the Display Committee is the appearance of one flight of "Fury" interceptors; for No. 43 (Fighter) Squadron only received its new equipment a few weeks ago. What we should like to know is the approximate date at which all the older fighters will have disappeared and all the squadrons of the Fighting Area will be equipped with the Bulldog and the Fury.

Next, the Display Committee may be congratulated upon the appearance at Hendon of two complete bomber squadrons flying the "Hart." This wonderful day-bomber aeroplane was only supplied to No. 33 (Bomber) Squadron last summer, and to No. 12 (B.) Squadron more recently. That both should be present in full force at this Display shows the right spirit. Certainly there will be some make-believe in the Set Piece, when the spectators will be asked to believe that "Siskins" are capable of tackling a squadron of Harts with success. This, we think, is a pity. We prefer that the Display should show the actual best of which the Royal Air Force is capable. However, serious-minded people should not treat the Set Piece too seriously. It is, we take it, chiefly intended to delight the crowd by providing an excuse for a big bang and a big blaze.

The parade of new and experimental types is always an interesting item, as it shows to those who have eyes to see the lines upon which various de-

signers are attacking those problems which are always with us and also the new problems which crop up as the science of aeronautics makes progress. But it is not easy to use this parade to point a moral and adorn a tale, as the appearance of a machine in this parade is not necessarily a guarantee that it has met with the approval of the Air Ministry and will become standard equipment for the Royal Air Force. At the moment, we believe, the greatest need of the Royal Air Force is a new design of night-bomber. The "Virginias," "Hyderabad" and "Hinaidis" have done faithful service, and it is time that they made way for something more modern. Whether we shall see the new standard type at Hendon on Saturday cannot be stated.

For the reasons given above, we consider that the programme for this year's Display is better than any programme for several years past; and we have not the slightest hesitation in recommending all our readers to get to Hendon on Saturday if they can possibly manage to do so.

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On Tuesday last, June 23, the House of Lords discussed British air communications with the East, on a motion by Lord Gage, who finally declared himself as very well satisfied with the statement made by the Air Minister, Lord Amulree.

Bad News from India The same evening the Simla correspondent of "The Times" sent a message to his paper announcing that orders had been issued to cease all expenditure on civil flying in India except for maintenance, and that meteorological and wireless stations had been ordered to close down.

If this report from Simla is to be accepted as accurate, it seems incredible that no rumours of it had reached Lord Amulree, and if the Air Minister had heard that this was to happen it is difficult to believe that he would have made no allusion to it in his statement to the House of Lords. He explained the situation in India, namely, that Dutch and French companies were flying across India, and that Imperial Airways were not able to do so because they could not fulfil the conditions as to Indian control which the Government of India had laid down. He went on to discuss the prospects of an air service beyond India to Burma, Malaya, and Australia, and mentioned the economic difficulties of the Commonwealth as a possible temporary handicap to the development of this service. Of economic difficulties in India which were likely to delay developments, Lord Amulree is not reported to have said a word. Yet, if it is a fact that the Government of India has ordered the closing down of all meteorological stations, all flying in the East is likely to be the sufferer. Such a step would be going much further than Lord Trenchard evidently desired in his protest against the internationalisation of civil flying.

We must hope that this report from Simla is not substantially correct. It certainly seems too bad to be true.



THE KING'S CUP AIR RACE.

Starting from and Finishing at Heston Aerodrome, July 25.

THE following entries have been received by the Royal Aero Club for the King's Cup Air Race, which starts from Heston on July 25 next. It will be seen that there are 41 entries, but late entries may be received up to July 1. The course will be

982½ miles, as follows:—Heston, Leicester, Norwich, Nottingham, Brough, Leeds, Birmingham, Woodford, Hooton, Heston, Shoreham, Hamble, Bristol, Heston. Further particulars of the course, regulations, etc., were published in our issue for March 20 last.

Entrant	Pilot	Aircraft and Engine
F. S. Symondson	F. S. Symondson	D. H. Moth 60 M, Gipsy I.
Alderman C. V. Walker	F/L. J. Bradbury	Blackburn "Bluebird," Mark IV, Gipsy I.
Fred Gough	Fred Gough	D.H. 60 X Moth, Gipsy I
S/L. James McKelvie	Lord Malcolm Douglas Hamilton	D.H. 60 G Moth, Gipsy I.
Air Vice-Marshal A. M. Longmore, C.B., D.S.O.	F/L. D. F. W. Atcherley	Blackburn "Bluebird," Hermes I.
Lieut. C. R. V. Pugh, R.N.	Lieut. C. R. V. Pugh, R.N.	Simmonds Spartan, Hermes II.
F/O. V. S. Bowling	F/O. V. S. Bowling	Civilian Coupé, Genet Major I.
P/O. F. L. D. Salter	F/L. W. L. Dawson	D. H. Moth, Gipsy I.
C. R. Belling	F/L. C. B. Wincott	Arrow "Active," Cirrus Hermes IIB.
The Right Hon. Lord Stonehaven, G.C.M.G., D.S.O.	M. L. Bramson	Martlet, Genet IIA.
T. W. Shipside	T. W. Shipside	D. H. Moth, Gipsy I.
Miss Winifred S. Brown	Miss Winifred S. Brown	Sports Avian, Hermes II.
F/O. J. W. Gillan	F/O. J. W. Gillan	Blackburn "Bluebird," Mark IV, Gipsy I.
"J. Wellworth"	"J. Wellworth"	Westland "Widgeon" III, Genet II.
L. M. J. Balfour	L. M. J. Balfour	D.H. Puss Moth, Gipsy III.
Lieut. Caspar John, R.N.	Lieut. Caspar John, R.N.	Avro Avian Mark IV, Cirrus III.
A. J. A. Wallace Barr	F/L. E. A. Healy	Avro Avian, Mark IV M, Genet Major I.
Miss Jean Forbes-Robertson	F/O. H. H. Leach	Martlet, Genet II.
G. N. Wilson	G. N. Wilson	D. H. 60 G Moth, Gipsy I.
"Lionel Hooton"	"Lionel Hooton"	D.H. 60 Moth, Gipsy I.
Capt. The Right Hon. F. E. Guest, P.C., D.S.O.	Capt. The Right Hon. F. E. Guest, P.C., D.S.O.; P/O. A. D. Selway	D.H. Gipsy Moth, Gipsy II.
Miss Diana H. C. Guest	Miss Diana H. C. Guest; F/O. Rupert Nash	D.H. Moth, Gipsy II.
Mrs. C. W. Slack	G. C. Walker	Blackburn "Bluebird," Mark IV, Gipsy I.
Robert McAlpine	F/O. E. C. T. Edwards	Blackburn "Bluebird," Mark IV, Hermes I.
Harald Peake	—	Blackburn "Bluebird," Mark IV, Gipsy I.
Miss Peggy Salaman	Lieut. P. G. Tremayne-Rodd, R. N.	D. H. Puss Moth, Gipsy III.
T. C. Fawcett	T. C. Fawcett	D. H. Moth 60 G, Gipsy I.
F/L. F. G. Gibbons	F/L. F. G. Gibbons	Simmonds Spartan, Hermes II.
F/O. J. F. X. McKenna	F/O. J. F. X. McKenna	Simmonds Spartan, Cirrus III.
"John Brown"	"John Brown"	D.H. 60 G Moth, Gipsy I.
F/L. G. H. Stainforth	—	Simmonds Spartan, Cirrus III
L. O. Russell	L. O. Russell	D.H. 60 M Moth, Gipsy I.
C. S. Napier	C. S. Napier	Westland "Widgeon," Gipsy I.
Arthur Franklyn	Arthur Franklyn	Avro Avian, Gipsy I.
J. C. Webster	J. C. Webster	Curtiss-Reid Rambler III, Gipsy III.
E. L. Gandar Dower	A. C. S. Irwin	D.H. Puss Moth, Gipsy III.
The Hon. Mrs. Victor Bruce	The Hon. Mrs. Victor Bruce	Blackburn "Bluebird," Mark IV, Gipsy III.
A. C. M. Jackaman	A. C. M. Jackaman	D.H. Puss Moth, Gipsy III.
H. R. Law	H. R. Law	Westland "Widgeon" III, Hermes II.
J. R. Chaplin	J. R. Chaplin	Avro Avian Mark IVM, Hermes II.
A. C. P. Johnstone	A. C. P. Johnstone	Avro Avian Mark IV, Cirrus III.

NOTE.—The entries are subject to final acceptance by the Royal Aero Club.



Our Flying Princes

WHEN the Prince of Wales visits the Scilly Isles—which form part of the Duchy of Cornwall—next month he will journey by air from London to Plymouth on July 15, proceeding later, probably by flying boat, to the Scilly Isles. He will return by seaplane next day to Plymouth, whence he will travel by aeroplane to London.

On June 17, Prince George flew from Smith's Lawn, Windsor Great Park, to Yarmouth, when he attended the Norfolk Agricultural Show.

Prof. Piccard

THE King and Queen of the Belgians, on June 18, attended a meeting in Brussels of the Fonds de Recherche Scientifique held in honour of Professor Piccard, the balloonist, and his assistant, M. Kipfer. An interesting point made by Professor Piccard was that his ascension had proved that the aeroplane of the future would seek to fly in the higher altitudes, because the atmosphere there

enabled a speed to be attained three times that which was possible in the lower strata. The aeroplane industry, he said, could confidently build with this object in view, because these upper altitudes presented no difficulty from the physiological point of view, provided that aeroplanes were fitted with airtight cabins. The Royal Aeronautical Society has invited Professor Piccard to deliver a lecture to the society. Professor Piccard has accepted the invitation, but he will not be able to come to London before October.

Royal Airmen

THE Duke of Apulia, cousin of the King of Italy, piloted a seaplane on June 18, carrying eighteen passengers, among them being Prince Christopher of Greece and Prince Alfonso de Bourbon, who are the Duke's guests at the Miramar Castle. They flew to Porto Fose, where they visited the airport and the flying school.

THE FARMAN "STRATOSPHERIC" AEROPLANE

RECENTLY it was announced that the Junkers firm of Dessau have under construction a machine for exploring the higher altitudes. It is not at present the intention to build for extreme heights, but merely to construct a machine in which the problems of supercharging, airtightness of cabin, and maintenance of ground level pressures inside the cabin may be studied.

In France, on the other hand, it would appear that preparations have been begun in real earnest for the production of an aircraft which, if theoretical calculations are justified in practice, should be capable of reaching a height not very far short of 20,000 metres (65,000 ft.). According to M. J. Coustolle, writing in our very excellent French contemporary *Les Ailes* of April 30, 1931, Mr. Henry Farman, in collaboration with M. Waseige, has begun the study of such a machine. Actually the Farman "Stratospheric" aeroplane is a type F.190 specially adapted for the purpose.

The first problem in the design of such a machine is, of course, the engine. For the experimental machine a new Farman engine is being produced, an 8-cylinder inverted vee-type water-cooled, normally developing 350 h.p. The inverted type has been chosen in this instance mainly because for a high-altitude aircraft a propeller of large diameter is necessary, and the inverted engine lends itself to installation in such a way as to get a maximum of ground clearance with a minimum of extra undercarriage height.

A special form of supercharging is being developed for this engine, consisting of three centrifugal blowers or compressors in series. The first takes its air direct from the surrounding atmosphere and delivers it at considerably increased pressure to the second blower, which in turn raises the pressure and delivers to the third blower, the outlet of which communicates with the carburettor and induction system of the engine. According to M. Coustolle, all three blowers run at 25,000 r.p.m., although one would have imagined that the speed would be progressively altered. The blowers, of course, absorb a not inconsiderable amount of power. It is estimated that the power required to drive the blowers is 60 h.p. for each, or a total of 180 h.p. This represents approximately 50 per cent. of the engine power at ground level, but it is pointed out that at the maximum altitude which it is expected to reach, the external pressure has decreased to such an extent that the power of the supercharged engine will have increased to something like 480 h.p., leaving some 300 h.p. available for the propulsion of the machine.

To provide good airscrew efficiency during take-off, subsequent climb, and again at the maximum altitude, a special four-bladed airscrew of large diameter and variable pitch is being produced. The diameter contemplated is 4.7 metres (15.1 ft.).

The machine itself is, as already mentioned, an adaptation of the well-known Farman F.190. The main change is one in wing area. This has been increased from the 40 sq. m. (430 sq. ft.) of the standard machine to 65 sq. m. (700 sq. ft.). The tail surfaces will be correspondingly

M. Henry Farman is at present studying an aeroplane for exploring the higher altitudes. The machine will be fitted with an inverted water-cooled engine, supercharged by three blowers in series. It is hoped to reach a height of some 65,000 ft. and the occupants will be housed in an airtight cylinder of Duralumin

increased to retain the necessary stability and controllability. The weight of the machine ready for flight will be in the neighbourhood of 2,500 kg. (5,500 lb.), and the speed at ground level is estimated at 240 km./h. (150 m.p.h.). What the speed will be at 65,000 ft. can only be guessed at. Assuming that the machine will reach that altitude, it is thought, however, that the speed at that height may be something like 500 km./h. (310 m.p.h.).

the speed at that height may be something like 500 km./h. (310 m.p.h.).

The Airtight Cabin

Externally the Farman 190 is not very greatly changed, but internally the placing of the crew in an airtight compartment has, of course, brought about a complete re-designing. In fact, the airtight compartment consists of a duralumin cylinder, mounted inside the normal fuselage structure. This cylinder is some 7 ft. long by about 3 ft. 4 in. in diameter. It is provided with small port holes covered with very thick glass, and access to the interior of the cylinder is by a manhole having an airtight cover. The pilot will, when reaching the higher altitudes, have to fly entirely by instruments, but while he is taking off, a trap door in the roof of the cylinder, in conjunction with an adjustable seat, will enable him to have his head outside until he has reached a height at which he is no longer in danger of collision with another aircraft. The pilot will then lower his seat, close the trap door (which is airtight), and proceed to fly "blind."

The problems connected with taking aircraft and engine controls, etc., out through the walls of the cylinder without getting leakage have, it is thought, been satisfactorily solved. The air inside the cylinder will be maintained, not necessarily at ground level pressure, but, at any rate, at a pressure such that the pilot can breathe without difficulty. This pressure will be maintained by means of a piston type of compressor driven by the engine. For the contingency of this compressor system failing, oxygen bottles will be carried inside the airtight compartment which, it is estimated, will enable the pilot to breathe until he can get his machine down to lower levels where the air pressure is high enough for direct use.

The renewal of air in the compartment will be ensured by a special automatic valve which permits air to escape from the compartment into the surrounding atmosphere at a given pressure.

Apart from the problems connected with the aircraft and engine, and which are formidable enough, there will be the question of how the various instruments will behave in extremely low temperatures, and whether they will, if the machine really attains the altitudes hoped for, accurately indicate and register the conditions of speed, pressure, temperature, etc., actually obtaining. If they do not, that is to say, if they give totally false readings, the work of building the special machine will be largely wasted. If, on the other hand, they function properly, much may be added to our present knowledge, and light may be thrown on the future prospects of the practicability of long-distance air services operating at great heights and speeds. At any rate, M. Farman is to be congratulated on his enterprise in tackling all these highly interesting problems.

Civil Aviation in India

An important announcement appeared in *The Times* of June 24 from their Simla correspondent regarding the position of civil aviation in India. It stated:—

"Orders have been issued to cease all expenditure on civil aviation in India, except for maintenance. Aeroplanes already ordered and now under construction will be completed, but no new staff is to be engaged. The civil aviation authorities here state that orders have already been received to close down meteorological and wireless stations, which is likely to raise a question of international obligations.

"The decision, which is a measure of economy, has naturally come as a shock to officials here, and has also caused the criticism that, as money was voted for the purpose by the Legislative Assembly, the present programme should have been completed.

"The question now arises of the maintenance of the

mail service from Karachi. The Imperial Airways contract expires on December 31. It is suggested in unofficial quarters here that it may be possible for it to take over the Indian machines now on order. The only alternative would seem to be Dutch or French services, and they would largely depend on the maintenance by the Government of India of satisfactory landing grounds.

"The official explanation of the step is that the whole question has merely been referred to the Retrenchment Advisory Committee for examination. As the recommendations of this committee cannot be known for some months, what is now a going concern will be hung up and will probably find it most difficult to begin again where it left off, even if the final decision is less drastic than the present order suggests. It appears that the total sum already spent, including aerodrome expenditure, is about £350,000, leaving an estimated balance of only £46,000 to complete the scheme."



BRISTOL SUMMER MEETING

WHEN the Bristol Air Port was opened by H.R.H. Prince George last year the weather gods were far from kind.

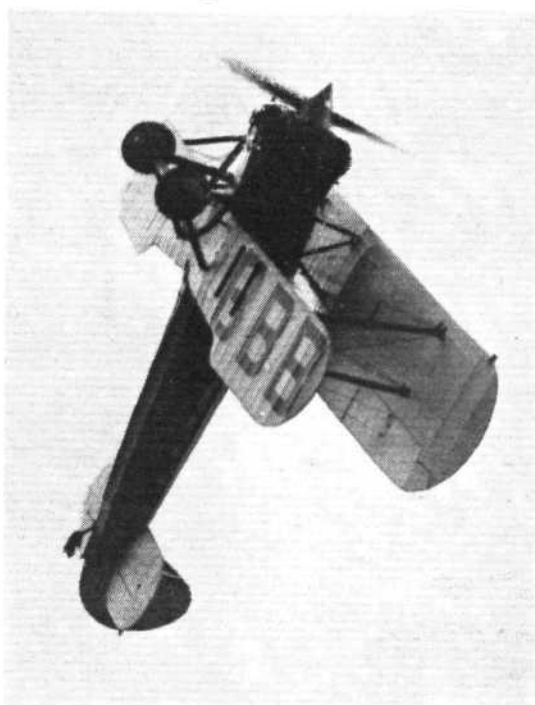
The rain came down heavily and the programme was badly interfered with in consequence. This year's summer meeting at the Air Port of Bristol, organised by the Bristol and Wessex Aeroplane Club, was held in glorious weather on Saturday, June 20, and the good Bristolians turned up in their thousands, some of them early enough to witness the finish of the race for the Challenge Trophy presented by the Society of British Aircraft Constructors. This race, which was for pilots trained *ab initio* by approved Light Aeroplane Clubs, was a handicap race, the machines starting from Heston. The winner was Mr. R. F. Hall, of the Lancashire Aero Club, who was flying a Hermes-Avian, and had with him as passenger Dr. Templeton. Second place was secured by the Bristol and Wessex Club's Cirrus II Moth, piloted by the Hon. H. C. H. Bathurst. The Household Brigade Flying Club was third with a Gipsy II Spartan.

Barnard's "Aerial Circus" (which wags have now dubbed "Barnum's") was in full swing, and among those taken up in the Jupiter-engined Fokker was the

Lord Mayor and Lady Mayoress of Bristol.

After the finish of the London-Bristol race, Captain Ayre gave an exhibition of aerobatics on Spartan G-ABJS, which showed not only the manoeuvrability of this machine, but also its controllability at low speeds.

The fly-past of the different types of aircraft was interesting in that practically every well known type of light plane took part, in addition to such commercial types as the Fokker and the Westland "Wessex." The Bristol "Brownie," which belongs to the Bristol and Wessex Aeroplane Club "formed" with the Salmson-Klemm, while Uwins showed the low-speed controllability of the "Bulldog" by keeping his place in the parade among machines of much lower top speed. An interesting newcomer to this country was a Potez type 36, similar to that exhibited at Paris last year. This little cabin monoplane is fitted with a species of Handley Page wing slots, but as these are permanently fitted on the machine in the fully open state, one would imagine that they must reduce the top speed very materially. This machine has been brought over by Captain C. D. Barnard, and for joy-riding in the vicinity of an aerodrome, where high cruising speed is not essential, the machine should



AN UNUSUAL VIEW OF THE BRISTOL "BULLDOG": Mr. C. F. Uwins doing a vertical bank. The picture should be held overhead to give an idea of how the machine appeared to the onlookers. (FLIGHT Photo.)



CONVINCING: This photograph shows better than any we have seen the ability of the Cierva "Autogiro" to land in a confined space. The pilot was Mr. Brie. (FLIGHT Photo.)



THE BARNARD "CIRCUS" AT THE BRISTOL AIRPORT: On the left a Potez with "Becs a Secrete," or slots fitted permanently open. On the right, the "Jupiter"-engined Fokker "Spider" taking up the Lord Mayor of Bristol, and party. (FLIGHT Photos.)

be very useful, as it certainly has a low landing speed and a good take-off and climb.

During the day Mr. Brie gave demonstrations of the Cierva "Autogiro," and his landings were made in such a way as to illustrate in the best possible manner the way in which this machine can get into a very confined space. One of our photographs shows this admirably.

Mr. Uwins gave the Bristolians cause for justifiable pride in one of their home products by showing what the Bristol "Bulldog" can do in the way of speed, climb, rolls, bunts, etc. His demonstration was slightly marred by his occasional wandering off the "stage" during some of his evolutions, to a part of the sky where the spectators could not readily see the machine. One of the Bristol evening papers had stated the night before that Mr. Uwins would use the sky as a spring mattress, and possibly the springs may have been too strong. But that was at least preferable to doing the stunts over the heads of the crowds, as so many pilots still persist in doing.

In a "utility competition" the machines were lined up with engines running, and the passengers had to run to the machines, which then made a circuit, landed and taxied up to "lock-ups." The wings were folded and the crews raced to the finishing tape. The competition turned into



COMPETITORS AND JUDGES: The upper photograph shows Mr. R. F. Hall and his passenger, Dr. Templeton, who, in a Hermes-Avian, won for the Lancashire Aero Club the S.B.A.C. Cup for a race from London to Bristol. The lower photograph shows Mr. H. Thomas, a director of the Bristol Aeroplane Company, and his son setting off from Filton for the Air Port at Whitchurch in a Bristol machine piloted by Mr. Campbell.

(FLIGHT Photos.)

an exciting race between a Parnall Elf and a De Havilland Puss Moth. The Puss Moth scored on the point of speed over the course, but "kited" a long way over the aerodrome and had to taxi back. The Elf, on the other hand, was landed very close to the lock-ups, with practically no run, and so evened matters up.

A parachute jump by John Trantum was novel in that two parachutes were used simultaneously. As might be expected, the rate of descent appeared slower than when a single parachute is used.

Altogether the "turns" shown at Bristol were quite good, if not very original. It is not very easy nowadays to think of anything new. But the organisation was at fault in the timing of events. Too often there was a prolonged wait between the finish of one event and the start of the next. Even Will Hay's running commentary, broadcast to all the enclosures, could not altogether make up for the long periods of waiting. It was unreasonable to expect even the "Headmaster of St. Michael's" to be unceasingly funny for 20-minute periods on end.

A word of praise for the handicappers should be said here. They were, as usual, Messrs. Dancy and Rowarth, and the finish of the London-Bristol race was a very close one indeed.



STRENUOUS BUT USEFUL: There was a close finish in the "Utility Race" between the crews of a Parnall "Elf" and a De Havilland "Puss Moth," the latter arriving on the ground first but gliding a long way, while the "Elf" was landed very near the finishing line. (FLIGHT Photo.)

Private Flying & Club News

THE READING MEETING

QUITE an excellent meeting was held by the Berks, Bucks and Oxon Aeroplane Club at Reading on Sunday, June 21.

A very much larger crowd than was expected arrived, and this must have numbered considerably over 10,000. There were some 70 visiting aircraft, bringing in them over 200 aerial visitors.

Twenty-six machines of various types were in a fly-past, which gave the crowd a very good idea of the large number of light aircraft, of different types, now built.

Sir Alan Cobham opened the meeting, and among those who were present were the Director of Civil Aviation, Col. Shelmerdine and Mrs. Shelmerdine; Lady Cynthia Slesser; Col. The Master of Sempill and Mrs. Sempill, Air Comm. and Mrs. J. Weir; Sqd.-Ldr. The Hon. F. E. Guest; and Herr Dr. Kipfer, who was Professor Piccard's assistant in his recent balloon ascent. Dr. Kipfer came from Brussels to Croydon by air on a three-day visit to England, and was met at Croydon by Col. Sempill, on behalf of the Royal Aeronautical Society of Great Britain.

During the show, Dr. Kipfer made a short speech, in which he described some of his experiences, and stated that they had sufficient oxygen to have risen a further 800 metres. It is understood that while in England Dr. Kipfer has been staying at Hanworth Park.

An incident of topical interest was the arrival, from Hanworth, of an N.F.S. Moth towing a B.A.C. glider. This glider has been christened "Barbara Cartland," after the well-known novelist, who was also a passenger in the Moth. The glider was flown by Mr. E. L. Mole, who released over the aerodrome and made a beautiful landing.

There were many of the usual demonstrations and humorous turns, such as an aerobatic display by Mr. P. M. Watt, who showed that the Martlet is undoubtedly one of the best civilian aircraft for aerobatics.

An old friend who has for so long been, as he told us, "eating very hot dust," is now with us again, and is, of course, the life and soul of the party. Quite why he wanted to eat dust we cannot understand, since we have never yet seen him fail to cope with any liquid offered him to assuage his thirst. We are referring to Mr. Tommy Rose, and on this occasion he distinguished himself by winning the obstacle race, which included no flying, but consisted chiefly in eating such things as toffee-apples! Later he gave an excellent display on an Avro Avian.

Capt. Stewart made an excellent parachute drop with a Russell-Lobe parachute. The lack of swing with this type was very noticeable.



Mr. Noel Smith, the Secretary of N.F.S., makes use of an incongruous steed when crossing Hanworth aerodrome. Like all efficient secretaries, he is evidently out to "deliver the goods." (FLIGHT Photo.)

Mr. C. F. Uwins, the well-known test pilot for the Bristol Aeroplane Co., flew a Bristol Bulldog, and gave the spectators an excellent idea of the speed and manoeuvrability of modern aircraft; while Mr. J. Cordes, of the Handley Page Co., as a contrast, dutifully showed how slow a Moth can be flown when fitted with slots.

There was also a demonstration of the Bluebird by Mr. Dick, and the Desoutter ambulance, flown by Mr. Cooper, disgorged a pseudo "case" into a waiting motor ambulance on the Aerodrome.

One of the items was a *Concours d'Elegance*, and this was won by a Mr. Alderson on his Gipsy Moth.

The prizes and cups were distributed by Miss Winifred



Flt.-Lt. Russell surrounded by members of the newly formed L.G.O.C. Flying Club. On his right is Driver Godwin, to whom the Club owes its formation. They have now purchased a Redwing and will start instructing some of their 1,500 members at Broxbourne Aerodrome shortly. It is hoped to cover expenses by the payment of 6d. per week and 5s. per hour for flying. Flt.-Lt. Russell, who is Sales Manager for the Redwing Co., has helped the Club's formation in many ways.



Mr. Shah, on the left, is the first Afghan to obtain his "A" pilot's licence in this country and did so at the Phillips & Powis School at Reading.



A. V. Roe & Co., Ltd., have recently supplied an Avian (Hermes II) to the Gothenburg Aero Club. The machine was subscribed for by prominent business men in Gothenburg, and was flown to Sweden by Mr. Gosta Andree, Secretary of the Club.

Brown, but whether these latter were filled with her favourite beverage, to wit, "balloon juice," we were unable to discover.

No description of the meeting would be complete without mention of the excellent announcing which was done by Mr. E. C. Brown. Meetings, particularly those which consist of demonstrations designed to bring before the spectators some particular flying point of the machines, are entirely dependent for their success upon a really well-informed and clever announcer, a point which was emphasised in our Editorial Comment for June 12.

THE LEICESTER CLUB have been giving a lead to all those people who are somewhat lackadaisical in using club aircraft. They have formed a "Dawn Patrol," and it has even been mentioned that it must be composed of "Hell's Angels," who never go to bed at all, since it is their practice to take off at 5.45 a.m. and fly to some such place as Croydon for breakfast, arriving back before 10 a.m.

Such enthusiasm needs no encouragement, but must in itself act as a great encourager to the other members.

Since the inception of the Club, 21 months ago, their two machines have averaged 83 hr. per month, with only one bent undercarriage and no replacements.

BROOKLANDS.—The habitués of Brooklands have been very sad during the last week, owing to the loss of Mr. G. Murray at Cambridge. Mr. Murray was one of the keenest private owners you could ever hope to meet, and, due to his ability to assimilate aerodynamical knowledge, he had become an amateur test-pilot of very great value. He combined cross-country flying ability with a marvellous aptitude for aerobatics, and every week used to fly from Brooklands to Edinburgh, and had also made several flights to Malta and back. He was a most modest young man, and flew solely with the object of furthering private flying.

THE BLACKPOOL PAGEANT.—A non-stop air race from Hanworth Aerodrome to Blackpool Municipal Aerodrome, Stanley Park, will be the principal feature of a pageant to be held at Stanley Park by National Flying Services, Ltd., on July 8.

The first prize will be a gold trophy and £60, and the second and third prizes £30 and £20.

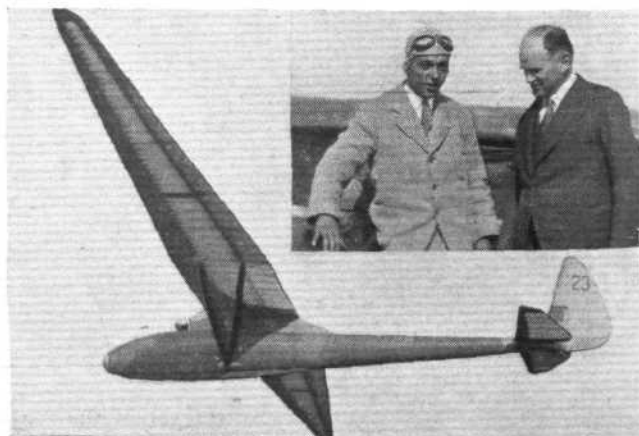
Other features will be a demonstration of the autogiro, auto-towed gliding, and acrobatic displays by well-known pilots.

Gliding

£1,000 FOR WHAT?

ON Saturday, June 20, Herr Robert Kronfeld, in his glider "Wien," won the prize of £1,000 offered by the *Daily Mail* to the first pilot to glide from St. Inglevert, in France, across the Channel to England, and, having landed, to glide back again in the same day, the start being made before noon of the day on which the flight was made and being accomplished before official darkness.

Starting at 5.45 p.m., after waiting since noon for suitable weather, Herr Kronfeld was towed up to a height of some 10,000 ft. by Herr Weichelt in a Klemm, which climb took about 1½ hour. He then glided straight across the Channel, and alighted at Swingate, near Dover, shortly before 8 p.m., within a short distance of the historic alighting place of M. Blériot on the first flight across the Channel on Sunday, July 25, 1909. The Klemm had followed him over and landed alongside him. After a short rest he took off again at 8.50 p.m. and climbed to about 11,000 ft. On casting off, the Klemm had to land again immediately, since Herr Weichelt had been unable to obtain suitable petrol to enable him to fly over the Channel again with Herr Kronfeld.



Herr Kronfeld talking to Mr. Gordon England, who observed his flight officially, while below is his sailplane, "The Wien." (Flight Photo.)



Herr Krause, whose attempt to advertise Lyons Tea by gliding the Channel in his "Falke," was forstalled by Herr Kronfeld.
(FLIGHT Photos.)

It is interesting to note that Herr Kronfeld then crossed the Channel so quickly on a straight course for Cape Gris Nez that he reached the lighthouse in exactly 20 min. Owing to a great deal of cloud he had seen nothing on the way over, and owing to his speed he thought that the lighthouse must be that of the Varne lightship, but shortly afterwards saw the breakers and the land. His altitude was then still 5,100 ft., so that he had only lost some 5,000 ft. in crossing the Channel, and reckoned that he could have gone nearly 40 miles further inland had he wished to. As it was rapidly getting dark he dared not come straight down, and circled round for another 40 min. before finding the Aerodrome of St. Inglevert and alighting on it finally at 10.20 p.m.

Careful organisation had been arranged by the B.G.A. to observe this flight, and there were official observers stationed both at St. Inglevert and Swingate, while Mr. Gordon England followed the flight, together with a *Daily Mail* photographer, for a great deal of the time in an N.F.S. Desoutter.

Shortly before Herr Kronfeld took off in the first place, that is at 5.45 p.m., Herr Krause, the pilot who is flying for the Lyons Tea Co. in a "Falke" glider, also attempted to start on the trip across. He was towed up and at one time was higher than Herr Kronfeld, but after three attempts when each time he cast loose, due to getting too much strain on the towing cable, he finally gave up the attempt.

On the day before, Friday, June 19, Mr. Lissant Beardmore, a Canadian opera singer, made what is claimed to be the first glide across the Channel. He was towed in his "Professor" sailplane by Mr. R. Roach in an Avro, and apparently landed at St. Inglevert, a little over half an hour later. He was backed by the *Daily Express* in his flight, and was chiefly concerned with getting over quickly in order that a British subject might have the honour of being the first man to glide the Channel. Whether or not he will be able to claim this

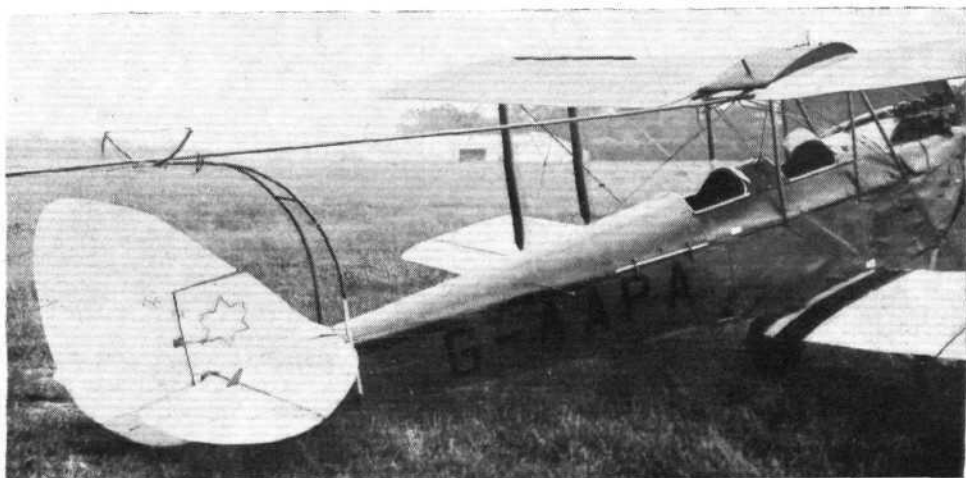
honour seems, in many quarters, to be open to a little doubt, since up to the present there has been no mention of any official observers of the flight, but possibly these will come forward later. Now that it has been done one might well ask what the point of it all was and what good such a newspaper as the *Daily Mail* has done by giving away £1,000 for a feat which proves nothing.

Last year Mr. Wallace Barr offered £1,000 for the first British subject in a British built sailplane who would take off by means of the ordinary shock cord launch, and gaining his height by soaring over a hill or otherwise using air conditions, such as an advancing cold front or cumulus clouds, proceed to glide across the Channel. Such a feat would very definitely contribute to the sum of our meteorological knowledge, and prove that the man who did it was an expert in soaring, and would very possibly contribute greatly to the furtherance of long distance travel in engineless aircraft. A straight glide across the Channel such as the *Daily Mail* has encouraged proves, however, exactly nothing. Given sufficient height there is no reason why the ordinary light aircraft, as, say, the Spartan or even the "giant air liner," beloved of the *Daily Press*, as the *Argosy* or *Hannibal*, should not go to 15,000 or 18,000 ft. or any height they like, and, in the presence of a Royal Aero Club observer, shut off their engines, put their noses down, and glide straight across. We cannot see any justification for the immense amount of publicity which has been given this feat, and imagine that Herr Kronfeld has merely done it because he saw that someone, presumably for their own purpose, was ready to give away £1,000, and he naturally picked it up just as anyone else with a reasonably efficient sailplane could have done. Our only consolation about the whole matter is that the publicity given to this event in the papers may draw public attention to gliding and thus increase the gliding clubs.

BRITISH TOWED GLIDING.—On Saturday, June 20, Mr. E. L. Mole was towed in a B.A.C. glider, built by the B.A.C. Aircraft, Ltd., of which Mr. Lowe Wylde is the Managing Director and Chief Designer, from Detling Aerodrome, near Maidstone, to Reading.

The glider is the property of Miss Barbara Cartland, the well-known novelist, who in private life is Mrs. Alexander McCorquodale, and who is understood to be interesting herself in this form of flying. By way of giving this flight a practical value, a letter from the Mayor of Maidstone to the Mayor of Reading was carried. The glider was towed by an N.F.S. Moth (Cirrus III), piloted by Mr. E. L. Wanliss, and covered the distance of just over 100 miles in about an hour, flying at a height of 2,000 ft. Such an effort may resuscitate the interest which was raised in Germany some four years ago when a train of even three gliders was towed behind one machine during a series of investigations to see whether such a method could be made of practical value.

It seems to us that the problem divides itself into two, firstly that of towing aircraft carrying mails, which may be slipped and piloted to earth on various points of a long cross country journey, or, secondly, a similar sort of arrangement for carrying passengers.



The N.F.S. Moth (Cirrus III.), which was fitted out to tow Herr Krause. The arrangement to keep the towing cable clear of the tail units seems adequate for the job and was made and designed in the N.F.S. workshops at Hanworth. (FLIGHT Photo.)

There would appear to be no doubt at all that both schemes offer very great advantages. The tug aircraft, as it will probably be called, could be built solely with efficiency of tractive effort as its main point, and carrying nothing more than a pilot and navigator and a very large load of petrol. Both the mail and passenger carrying engineless machines could then be built with extreme aerodynamical efficiency, since there would be no need for such excrescences as engines causing consequential unequal air flow round the fuselage, together with other projections, such as fuel supply pipes, etc.

Economy would also be effected in the matter of pilots, since the pilot in charge of the glider would merely need to be efficient for making landings and not a navigation expert, or be worried with the correct handling of an engine.

In the matter of passenger comfort, a tremendous advantage would accrue from this type of transport, since two of the most prominent deterrents to passenger travel would automatically be removed. The first and probably the most important would be that of discomfort, and we visualise the practicability of making the passenger accommodation far more comfortable than is yet provided in any form of public transport whether on land or in the air, such as in airships. Noise would be non-existent, and the whole of the accommodation within the flying machine could be utilised solely for the benefit of passengers. Moreover, a very great deal of weight could be saved, since no special measures, such as sound-proof walls, would need to be incorporated, thus allowing a far greater margin of weight for providing really comfortable upholstery and cabin fittings, and smoking, the prohibition of which deters a great number of people from flying in existing machines, could, of course, be allowed.

Secondly, by virtue of being thoroughly efficient aerodynamically, such aircraft would, we assume, have an extremely flat gliding angle, enabling them in the case of engine failure in the tug aircraft to glide very long distances before alighting, thus making it possible to pick a suitable landing ground over a far greater area than is possible with power-driven aircraft, and if, as we assume they would be, such aircraft were fitted with some form of spoilers which could be operated to coarsen the glide when desired, the danger from forced landings would, to all intents and purposes, be eliminated. Telephonic communication with the pilot of the tug aircraft would be an easy matter to arrange, as well as a wireless receiver, which could pick up music or information of interest to the passengers.

Such a scheme as this would enable both aircraft to be designed entirely for their own jobs, and would do away with one of the greatest bug-bears of aircraft designers, namely compromise.

We understand that the Luft Hansa are spending a considerable amount of money on investigating such a



Mr. Lissant Beardmore with his Professor Sailplane, on which he crossed the Channel the day before Herr Kronfeld did the return trip.

proposition, and a claim is already made by the Germans that the load which can be transported by a certain engine power in this way is increased by 60 per cent. Moreover, since the parasitic drag of the towed aircraft could be kept to a minimum, the range for a certain load of fuel in the tug aircraft would automatically be greatly increased.

HERTS AND ESSEX GLIDING CLUB will be holding a Display at Spelbrook, Bishop's Stortford, on Sunday, June 28, commencing at 2.30 p.m. There will be demonstrations of auto-towed gliding, with a two-seater glider by Mr. Lowe Wylde. There will also be a considerable amount of flying with well-known aircraft, and joy-riding from noon until dusk. Entrance to the Aerodrome will be 6d. for Adults, and Children half-price. Further particulars may be obtained from Mr. R. Dixey Gerrans, Bishop's Stortford. 'Phone 280.



Herr Fuchs of the Akademische Fliegergruppe Darmstadt, landing at Staaken in the "Starkenburger," after having flown from the Tempelhof Aerodrome over the City of Berlin. He was towed up to gain his initial altitude by a Klemm (Argus).



Air Transport

AIR SIGNS

IN view of the development of flying in this country, the Civil Aviation Section of the London Chamber of Commerce has for some time had under consideration the subject of ground marks as an aid to air navigation. It was appreciated that, to be of real utility, such ground marks must conform to some uniform system, and it was felt that the time had come when such a system should be introduced.

On its suggestion, the Automobile Association has prepared a memorandum on the subject which has been approved not only by the Section, but by the Air Ministry and the Royal Aero Club.

The Standing Committee of the Section, of which Colonel the Master of Sempill is Chairman, numbers amongst its members many of the leaders of Civil Aviation in this country, as well as representatives of the Automobile Association, the Royal Aero Club and the Society of British Aircraft Constructors. It has decided to recommend the system of Air Signs set out in the Automobile Association's memorandum for adoption throughout Great Britain. With this end in view, it is in touch with Local Authorities throughout the country, the Ministry of Health, the Aerodromes Committee of the R.I.B.A., The Town Planning Institute, the Association of Municipal Corporations, the Rural District Councils' Association and other interested bodies.

The following is the text of the memorandum:—

1.—Air Signs are primarily designed to be of service to pilots who have deviated from their course and who require to know their position.

2.—Air Signs will be more necessary where geographical features easily recognisable from the air are lacking. The positions of Air Signs should be marked on flying maps.

3.—Air Signs should be so situated that a pilot who is lost may be able readily to find them.

To enable him to do this, Air Signs should be situated whenever possible near to a railway line. If a pilot, who is lost, crosses a railway line he should, by following it, eventually reach the Air Sign of the nearest town of importance.

The positions of the Air Signs should invariably be the same with relation to the town they designate. As the prevailing wind in England is from the S.W., Air Signs should be placed to the S.W. of towns so that they run the least chance of being obscured by smoke. A pilot flying over an unknown town will know that he has to look to the S.W. of the town to find the Air Sign. The fact that there is no railway to the S.W. of the town should not preclude the Air Sign being placed there.

In certain localities it may be convenient to have Air Signs on Gas containers, but it is suggested that such signs should be regarded as additional to a National scheme of Standard Signs situated to the S.W. of every town.

4.—An Air Sign should be capable of being distinguished from any other sign, such as an advertisement.

Advertisements readable from the air may increase with the growth of aviation, and may give rise to confusion. Air Signs should, therefore, be preceded by a recognised characteristic.

It is recommended that the characteristic preceding an Air Sign should consist of an arrow pointing to true North with the letter N in the middle of the arrow. The total length of the arrow should be 20 feet.

5.—An Air Sign should be of such a size that it can be read from at least 2,000 ft. Where the Air Sign is situated in a restricted space standard abbreviations of the name should be used.

The optimum dimensions of the letters of an Air Sign are as follows:—Length, 20 ft.; width, 16 ft.; stroke, 3 ft.; space, 16 ft.

Where there is not space to adopt these measurements, proportionately smaller letters should be used.

The colour of an Air Sign should be white letters, where possible on a black background.

Certain terminations of place names in Britain are sufficiently common to enable standard abbreviations to be adopted. Thus:—Bridge BG, Woodbridge WOODBG;—Chester CHR, Manchester MANCHR;—Ford FD, Stam-

ford STAMFD;—ham M, —ing N, Altringham ALTRNM;—stone STN, Wealdstone WEALDSTN.

6. An Air Sign should give the name of a place that is easily recognisable on the map. If not situated there, it should give the direction and the distance to such a place. There are places in industrial districts, such as the surroundings of Birmingham and Manchester, that are not readily distinguishable one from the other. It would be preferable to air sign these with the name of the chief centre, adding an arrow pointing to the centre named and a figure or figures giving the distance in miles. Thus, Prestwich would be air signed, say, "MANCHR," with an arrow pointing S.E. and the figure 4 denoting the distance in miles to the centre of Manchester. The arrow would indicate to the pilot that by flying N.W. he would be avoiding a densely inhabited area. The position of this directional arrow, where it is used, should be between the characteristic North sign and the name of the place, so that the directional arrow will be next to the arrow pointing North. This will make it easier for the pilot to recognise the direction of the place named in the sign. The figure denoting the distance in miles to the place named should be in the middle of the arrow. The length of the directional arrow should be 20 feet, and it should be immediately alongside the North arrow and 16 feet from the first letter of the place named.

7. The quantities of chalk required to form the characteristic sign, the directional sign and each letter of the alphabet are given in the attached schedule. These may serve as a guide to the expense of laying down an air sign, the expense, naturally, varying in the several localities with the cost of transporting the chalk from the nearest available supply.

8. The price for an average word of seven letters in concrete with a curved upper surface to the standard measurements is approximately £45 within a 50-mile radius of London. This price, it is understood, includes the provision of a lightweight mesh reinforcement of "Twiststeel" placed in the bottom of the concrete to prevent the formation of large shrinkage cracks.

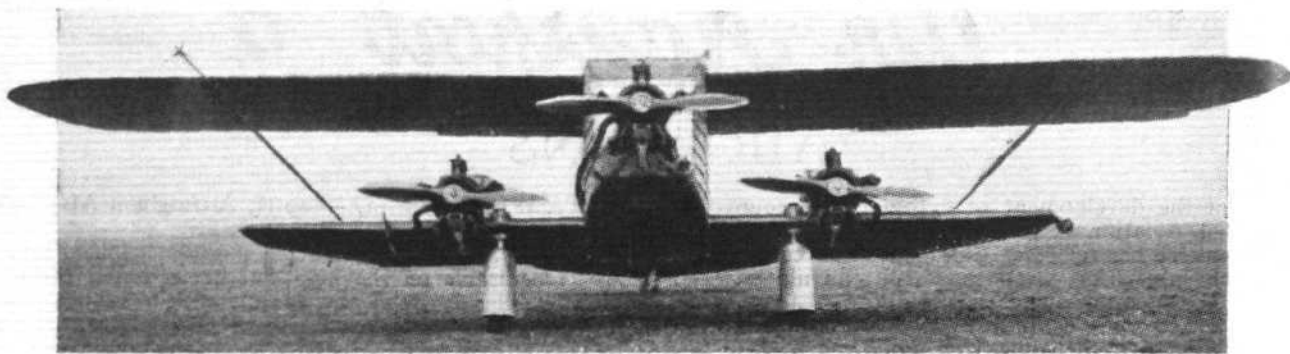
Abbreviations of Place Names for Air Signs.

1. Abbreviation of names of seven letters and under is unnecessary.

2. Abbreviations should be made at the termination of a name in preference to the beginning.

3. Abbreviations may be of the following kinds:—(a) When a place has a shorter and alternative name that is in common use, this should be taken for the Air Sign. Examples:—Salisbury, SARUM; Shaftesbury, SHASTON; Southampton, SOTON. (b) When a place name is preceded by the word "Saint," this may be omitted. (c) Certain syllables that occur frequently in place names may be abbreviated. To avoid confusion the same abbreviations should be applied wherever necessary. A list of these is given below:—

—AN ..	.. —N	—HILL ..	.. —HL
—BROUGH ..	.. —BRO	—HOUSE ..	.. —HO
—BOROUGH ..	.. —BRO	—HURST ..	.. —HST
—BURGH ..	.. —BG	—ING ..	.. —N
—BRIDGE ..	.. —BG	—LAND ..	.. —LD
—BRICK ..	.. —BK	—LEIGH ..	.. —LY
—BROCK ..	.. —BK	—MERE ..	.. —MR
—BURN ..	.. —BN	—MINSTER ..	.. —MSR
—BOURNE ..	.. —BN	—MOUTH ..	.. —MO
—BORNE ..	.. —BN	—NORTH ..	.. —NTH
—BEY ..	.. —BY	—ON ..	.. —N
—BURY ..	.. —BY	—POINT ..	.. —PT
—CASTLE ..	.. —CSL	—PORT ..	.. —PT
—CASTER ..	.. —CSR	—PORTH ..	.. —PTH
—CESTER ..	.. —CHR	—QUAY ..	.. —QY
—CHESTER ..	.. —CHR	—SIDE ..	.. —SI
—CHURCH ..	.. —CH	—STABLE ..	.. —SBL
—CROSS ..	.. —C	—STAPLE ..	.. —SPL
—DALE ..	.. —DL	—STOCK ..	.. —STO
—DRIDGE ..	.. —DG	—STOKE ..	.. —STO
—EN ..	.. —N	—STOW ..	.. —STO
—ER ..	.. —R	—STED ..	.. —STD
—FIELD ..	.. —FLD	—STEAD ..	.. —STD
—FLEET ..	.. —FLT	—STONE ..	.. —STN
—FORD ..	.. —FD	—THORPE ..	.. —THP
—FORTH ..	.. —FTH	—VILLE ..	.. —VL
—GATE ..	.. —GT	—WADE ..	.. —WD
—GROVE ..	.. —GRO	—WOOD ..	.. —WD
—HAM ..	.. —M	—WOLD ..	.. —WLD
—HEAD ..	.. —HD	—WATER ..	.. —WTR
—HEATH ..	.. —HTH	—WELL ..	.. —WL



A NEW BREGUET TRANSPORT MACHINE: The Breguet 391 T is a development of the famous military type 27, but is fitted with three Gnome-Rhone "Titan" engines of 230 h.p. each. The machine has seating accommodation for 10 passengers. (Photo by courtesy of L'AERONAUTIQUE.)

The Dutch Service to Australia

In the natural excitement caused a short time ago by the first experimental England-Australia and return air mail, operated by Imperial Airways, Ltd., little was heard of another and, perhaps, not unimportant experimental air-mail link between England and Australia. About the same time as the Imperial flights to and from Australia, mails from London were being carried by air to Australia along an existing and well-organised Dutch route operated from England to Holland and from Holland to Batavia by the Royal Dutch Air Lines, a Company well known for the regularity of its Amsterdam-Batavia fortnightly air-mail service. From the Dutch East Indies to Australia the last link in the chain was forged by a return mail flight between Batavia and Australia by the K.N.I.L.M., a Dutch East Indies air-traffic company, which operates highly successful air lines in the Netherlands Indies. The outward trip was without incident and ran to schedule, and the mail machine from Batavia to Australia was named the "Abel Tasman," after the Dutch explorer who discovered Australia in 1642. The return journey to England was interesting, because, from Sydney to London, the mails only took 18 days, and of these, two were spent inactively in the Dutch Indies because the "Abel Tasman" arrived two days before the K.L.M. Batavia-Amsterdam machine was scheduled to depart for Europe. Thus, if such a service became regular, there is no reason why the Australia-England journey should not be performed in 16 to 17 days with regularity. The Amsterdam-Batavia line of the Royal Dutch Air Lines is already so popular that a number of passengers have been carried

the 9,000 miles by air, amongst them being a well-known Dutch stage favourite on the homeward trip, and a business man of 64 on the trip to the Colonies. In October next, this successful air link between Holland and her overseas Colonies will, it is hoped, be operated weekly. Passengers and freight, as well as mails, will be carried, and departures will be every Thursday from Holland and every Friday from Batavia.

On June 23, Mr. Gyles Mackrell, D.F.C. (late R.F.C. and R.A.F.) arrived at Croydon from Calcutta by K.L.M., having completed the trip in seven days. Mr. Mackrell, who is Tea Estate Visiting Inspector for Messrs. Octavius Steel & Co., Calcutta and London, is on a business visit to this country, and has booked a return ticket by K.L.M. to Calcutta for July 9. He thus gets seventeen days in England, with a total absence from Calcutta of only one month. He spoke very highly of the K.L.M. Far Eastern service as to comfort and efficiency.

Money Order Service to Ceylon by Air Mail

THE Postmaster-General gives notice that a service for the transmission of money orders by Air Mail to Ceylon has been arranged. For each order so advised, in addition to the ordinary poundage, a fee of 5d. will be charged.

Record Mail to Canada

THE swift passage of the *Empress of Britain*, coupled with the use of aircraft, has made possible a record time for the delivery of British mail in Canada. The mail left Southampton on June 17, and was transferred at Father Point from the liner to an aeroplane at daybreak on June 22, reaching Montreal at 8 a.m. Five days were thus occupied in transit of the mails.

A Striking Memorial

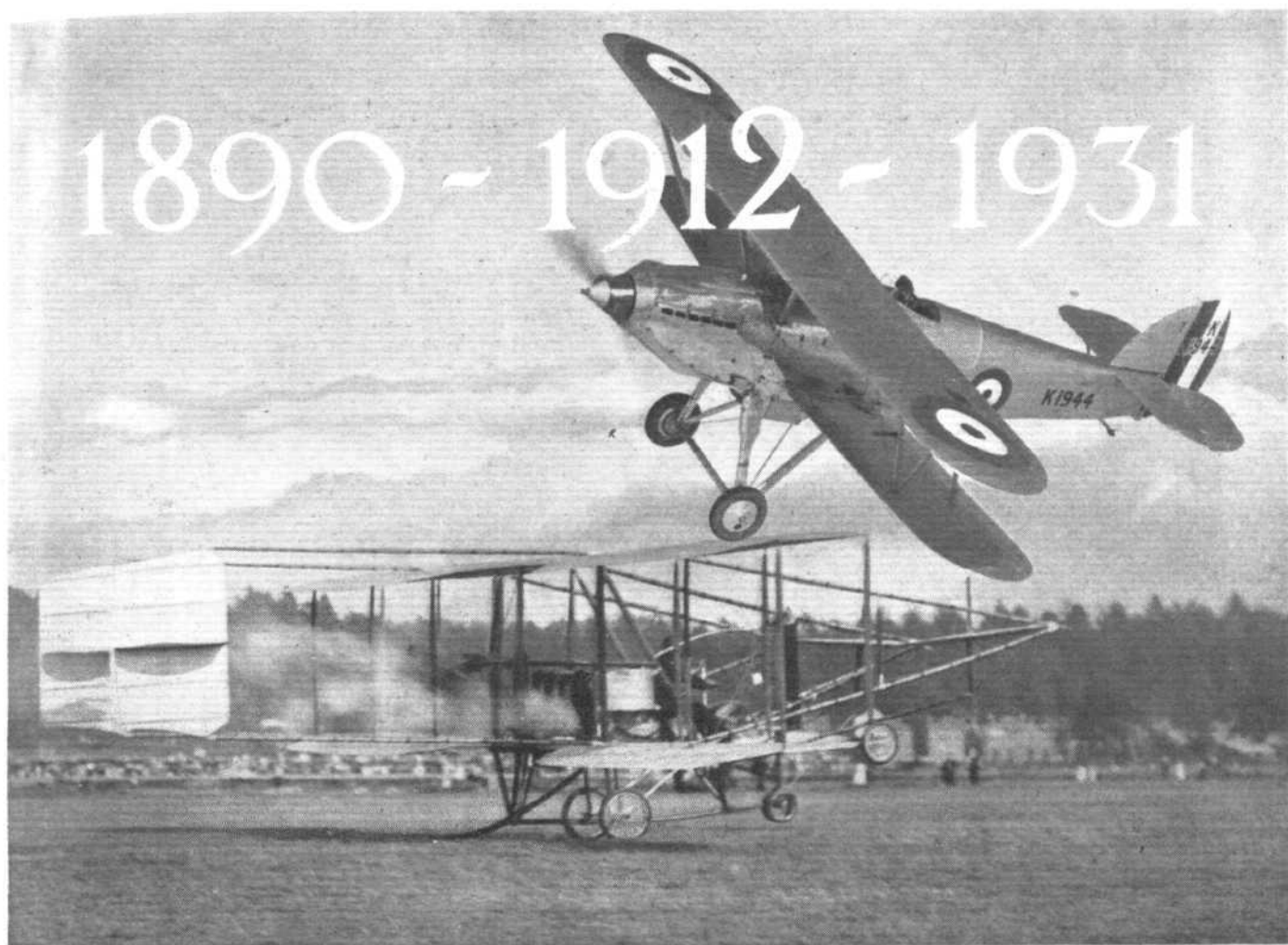
A MEMORIAL to the French airman, Guilbaud, to Roald Amundsen, and to the crew of the flying boat Latham 47, who perished in an attempt to rescue General Nobile and his companions of the airship "Italia," was unveiled by M. Dumesnil, the Minister for Air, at Caudebec-en-Caux on June 21. The monument stands upon the spot from which Guilbaud took off for Bergen. Cast in reinforced concrete, it represents the hull and wings of the flying boat emerging from an iceberg.

T.M.A.C. Visit to Halton

ALL Wings of T.M.A.C. have been invited by The Halton Model Aircraft and Engineering Society to visit Halton on Saturday, July 18. Will all Wing-Commanders please notify the Honorary Secretary, A. E. Jones, 48, Narcissus Road, West Hampstead, N.W.6, how many members of their Wings are desirous of taking advantage of this invitation. Teas will be provided at 1s. per head.



A Striking Memorial.



A brief outline of the growth of
British Air Power from the Balloon
Company of the Royal Engineers to
the present day

ROYAL AIR FORCE

By MAJOR F. A. de V. ROBERTSON, V.D.

THE Royal Air Force Display at Hendon each year is one of the most beautiful and popular events of the London summer season. At the Display the public is able to see the marvellous state of training which has been attained by the youngest of the fighting services. Infinitely various are the performances given by the aircraft, some performing singly and some in formation. Most popular of all are the evolutions by whole squadrons. The precision of the drill in the air rivals that of the Guards when the Colours are trooped on the King's birthday.

There must be many spectators who can remember the days before the war when such a flying display was utterly out of the question. The Royal Flying Corps and the Royal Naval Air Service were then scarcely recognised. They were little more than interesting and picturesque experiments, in which the Lords of the Admiralty and the members of the Army Council had no strong confidence. There was no reason why the authorities should rely upon their air arms. Those arms had to learn their business in the stress of war, and there was so much to be learnt, and the limitations of the aeroplane were so great, that it is hardly surprising that in the early days the higher command sometimes looked with suspicion even on very accurate reports sent in by observers from the air.

The First Four Squadrons

All but a few of the squadrons of landplanes which contribute to the Display this week were formed during the

war. In August, 1914, the Royal Flying Corps (Military Wing) comprised only four squadrons, Nos. 2, 3, 4 and 5. They were not then called "fighter squadrons" or "bomber squadrons" or "army co-operation squadrons," as in those days no one had ever thought of such distinctions. The only work which it was imagined that aircraft could do was to reconnoitre for the Army, and report the movements of the enemy. All the four original squadrons, therefore, were army co-operation squadrons. They did not, however, co-operate to the extent which is now possible. In 1914 there was no such thing as picking up messages from the rifles of the infantry, dropping ammunition and supplies, photographing the enemy trenches, or attacking the enemy troops with bombs and machine-gun fire. The aeroplanes merely observed, and the observer in the back seat wrote reports of what he had seen or thought he had seen. Sometimes, during the fighting round Mons, inexperienced observers mistook a cemetery for a German encampment. Sometimes a patch of tarred road was thought to be marching infantry. It was not surprising that the generals did not always trust reports from the air. Nevertheless, it was an aeroplane which first made known to Sir John French the movement by which General von Kluck tried to turn the left wing of the British Army.

Gradually the four squadrons of the R.F.C. learnt how to do their work in war conditions, and gradually the staff learnt to rely more and more upon their reports, until in the end no great attack was ever undertaken by

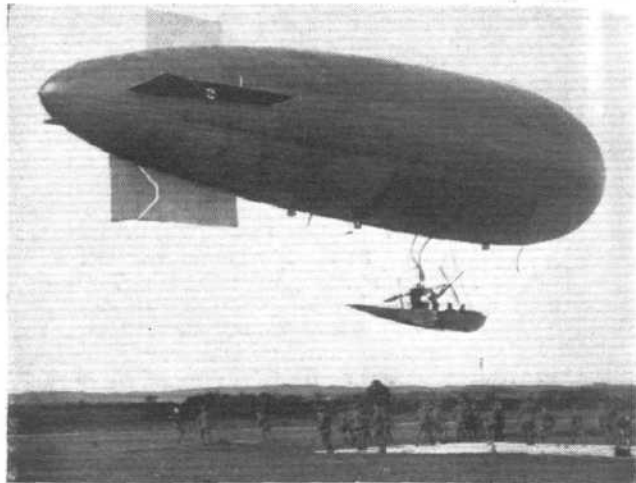


CODY'S "CATHEDRAL": IT WAS ON A MACHINE OF THIS TYPE THAT CODY WON THE MILITARY TRIALS IN 1912. (Flight Photo.)



AN EARLY MILITARY MACHINE: THE BRISTOL "BOX KITE" RESEMBLED IN A GENERAL WAY THE FARMANS OF THE SAME PERIOD. IT WAS FITTED WITH A Gnome ROTARY ENGINE DRIVING A PUSHER AIRSCREW. MANY EARLY PILOTS WERE TRAINED ON THIS TYPE OF MACHINE.

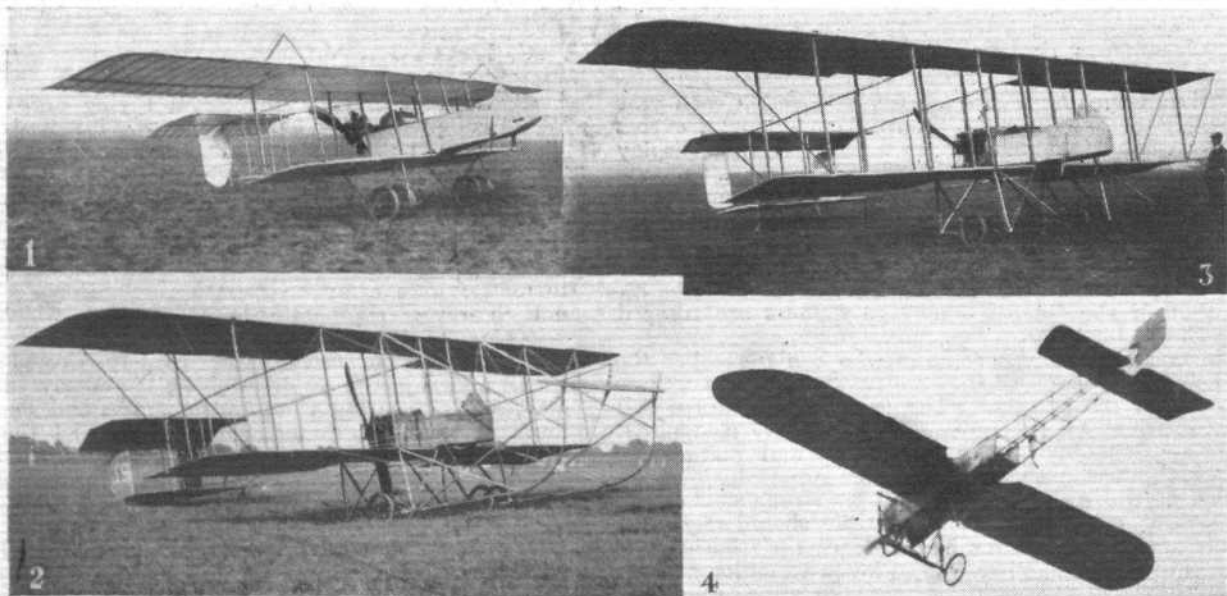
the British forces until the ground had been thoroughly reconnoitred and photographed from the air. Photography was developed, and so was the art of spotting for the guns. At the same time bombing from the air began to be practised. It was a crude affair at first; for the pilots merely put some grenades into their cockpits and threw them overboard by hand when they had got over an enemy headquarters or railway station or munition dump. Then fighting in the air began. The first German aeroplane which was driven down behind our lines was not shot down. It was pursued by Lieut. Maitland in a B.E.2 and was apparently frightened into landing, for the British



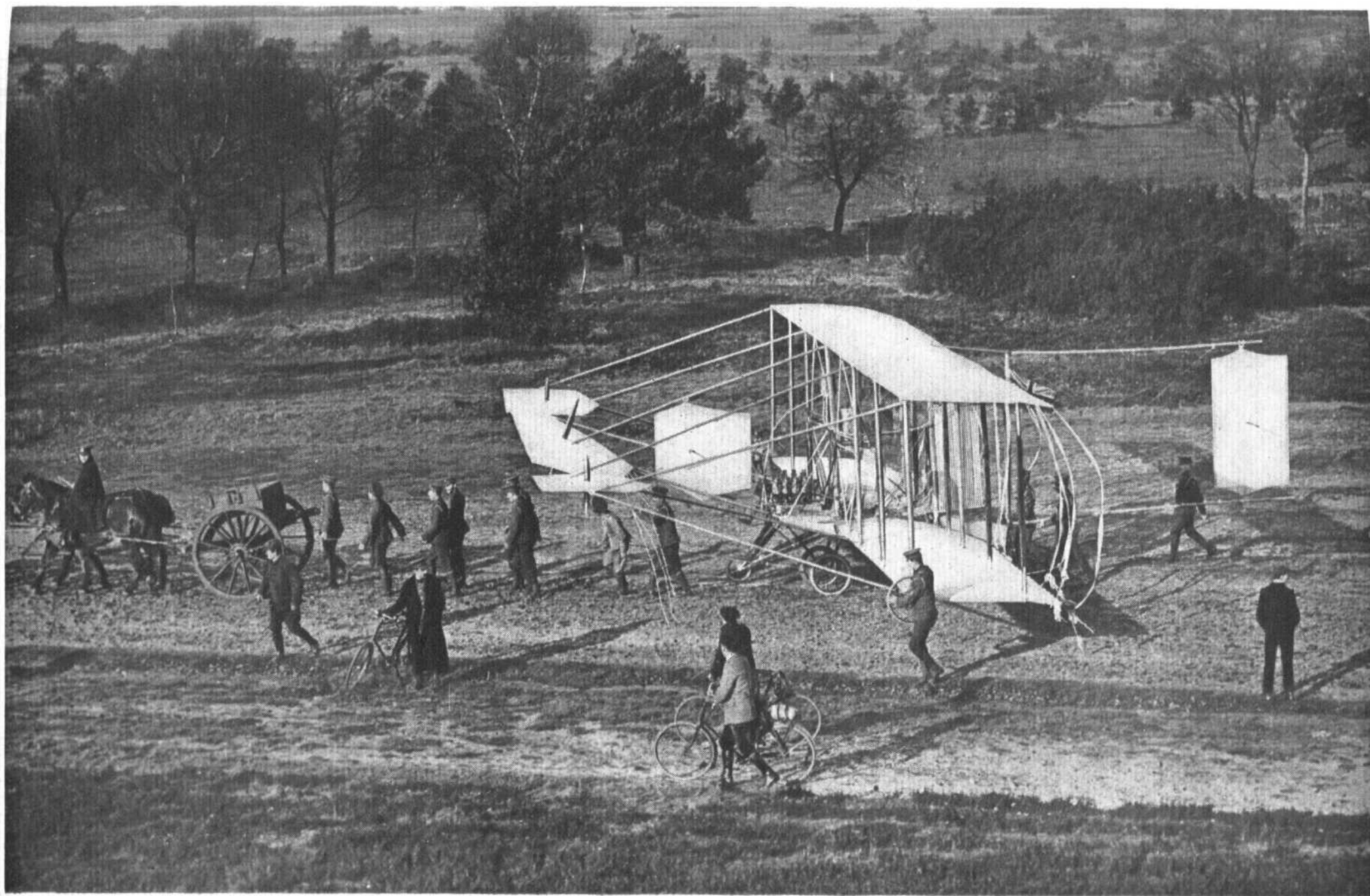
A "BALLOON FACTORY" PRODUCT: THIS IS THE "BETA," ORIGINALLY BUILT IN 1909 AS THE "BABY," RECONSTRUCTED IN 1910 WITH 30 H.P. GREEN ENGINE.

observer, Lieut. Harvey-Kelly, had only a revolver. Observers at that time began to carry pistols and carbines to fire at enemy aircraft. By degrees it was found necessary to design special machines for bombing and for fighting, and ultimately separate squadrons were trained for these different classes of work.

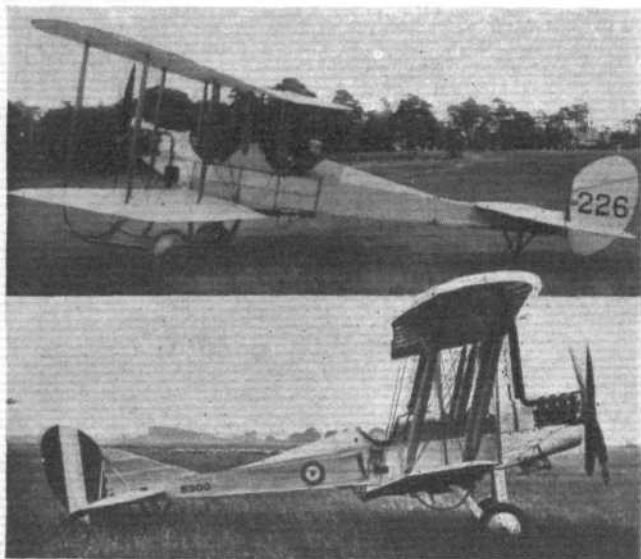
It is interesting to remember these facts as one looks at the Display. Of the four original squadrons of the R.F.C. which flew across to France in August, 1914, three are still army co-operation squadrons. No. 5 is in India, stationed at Quetta, and is equipped with the "Wapiti" with "Jupiter" engine. At the outbreak of the great war it had an assortment of three different types of aeroplane, Henry Farmans, Avros and B.E.8 machines. No. 3 had Blériots and Henry Farmans. Formation flying was not used in those days, so it was not thought so very important that a squadron should be entirely equipped with one type. But it entailed great labour and trouble to keep spare parts for three different types. Now Nos. 2, 3 and 4 Squadrons are stationed in Great Britain. Nos. 2 and 4 are army co-operation squadrons, and use the "Atlas" with "Jaguar" engine. The Wapiti and the Atlas are both equipped for photography, for light bombing, for spotting for the artillery, for sending and receiving wireless messages, and for picking up messages from the rifles of the infantry, as will be seen at the Display. On another page there is also a photograph of an Atlas of



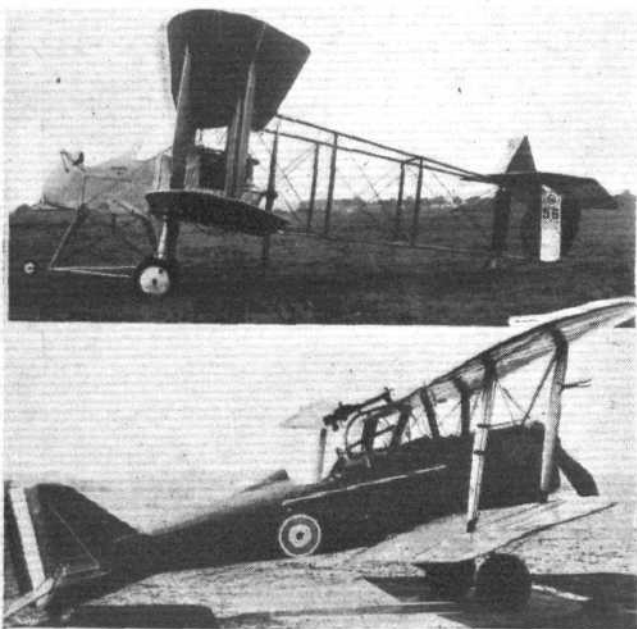
SOME EARLY AEROPLANES: 1, THE HENRY FARMAN, WAS CHARACTERISED BY A LARGE SPAN TOP PLANE. NOTE THAT THE Gnome ROTARY ENGINE IS MOUNTED AS A PUSHER. 2, THE MAURICE FARMAN "LONGHORN," WAS ALSO A PUSHER, BUT HAD A FRONT ELEVATOR. 3, THE MAURICE FARMAN "SHORTHORN" HAD NO FRONT ELEVATOR, BOTH TYPES WERE FITTED WITH RENAULT ENGINES. THE BLERIOT MONOPLANE, SHOWN IN 4, WAS A TWO-SEATER. LATERAL CONTROL WAS BY WING-WARPING.



THE BRITISH ARMY BIPLANE: AFTER SEVERAL PREVIOUS ATTEMPTS AT HEAVIER-THAN-AIR FLIGHT, COL. S. F. CODY, IN JANUARY, 1909, SUCCEEDED IN MAKING A "FLIGHT" OF 20 YARDS ON LAFFAN'S PLAIN IN THIS MACHINE, CONSTRUCTED AT THE BALLOON FACTORY, ALDERSHOT.



SOME AIRCRAFT FACTORY PRODUCTS: THE B.E.2 (TOP) WAS THE FORERUNNER OF A SERIES OF TYPES. IT HAD WARPING WINGS. THE B.E.2C (BOTTOM) WAS FAMOUS FOR ITS STABILITY, AND WAS BUILT IN LARGE NUMBERS DURING THE WAR.



"FACTORY DESIGNED": THE F.E.2B, 120 BEARD-MORE ENGINE, WAS USED BY NO. 20 SQUADRON AND OTHERS, AND HELPED TO DEFEAT THE FOKKER MONOPLANE. IT WAS A PUSHER, WITH OPEN TAIL GIRDER. THE S.E.5A WAS AN EARLY SINGLE-SEATER FIGHTER, AND WAS FLOWN BY (AMONG OTHERS) MAJOR MANNOCK, V.C.

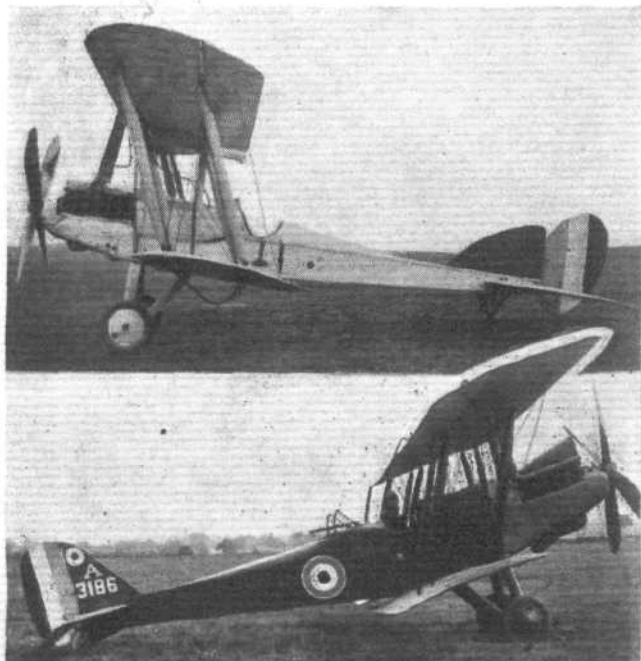
No. 2 Army Co-operation squadron picking up a message from the infantry. In addition, the Atlas machines seen to-day have one fixed Vickers machine gun, which fires forward through the propeller, and a movable Lewis gun on a ring in the rear cockpit. An Atlas is thus able to put up a fight if it is attacked, and it is also able to fire at enemy troops on the ground. At the Hendon Display, by the way, the Wapiti does not appear as an army co-operation machine, but as a day-bomber. In India, it is used in either capacity. When one thinks that these two squadrons, Nos. 2 and 4, went to France with the Old Contemptibles flying the B.E. type, one is amazed at how things have changed in 17 years. Incidentally, those two squadrons were reckoned very lucky to be almost completely equipped with the B.E.2 (one flight of No. 4 had Maurice Farman "Shorthorns"), for the B.E.2 was one of the best aeroplanes in existence at the time.

The fourth of those original squadrons, No. 3, has gone right away from army co-operation work. It is now a fighter squadron, and uses the single-seater "Bulldog" with Jupiter engine. At the Display it will be one of the three squadrons which compose the fighter wing, namely, Nos. 3, 17 and 54, all of them using the Bulldog, which is at the moment the standard fighter machine of the Fighting Area in the command known as Air Defence of Great Britain. When one considers the three qualities of speed, climb and endurance in the air, combined with armament, manoeuvrability and all the other qualities required of a modern fighter, the Bulldog is the best machine of its class in the world. It is not an interceptor fighter, which belongs to a different class and has other qualities. When one watches the performance of No. 3 Squadron in its Bulldogs at the Display, it will be very interesting to recall that it went overseas in 1914 with Blériot monoplanes and Henry Farman biplanes, both machines of French design. In those days the British aircraft industry was not in a position to equip our four squadrons with machines of British design, and we had to have recourse to France. The engines used by us in the earlier days of the war were almost all of French design and manufacture.

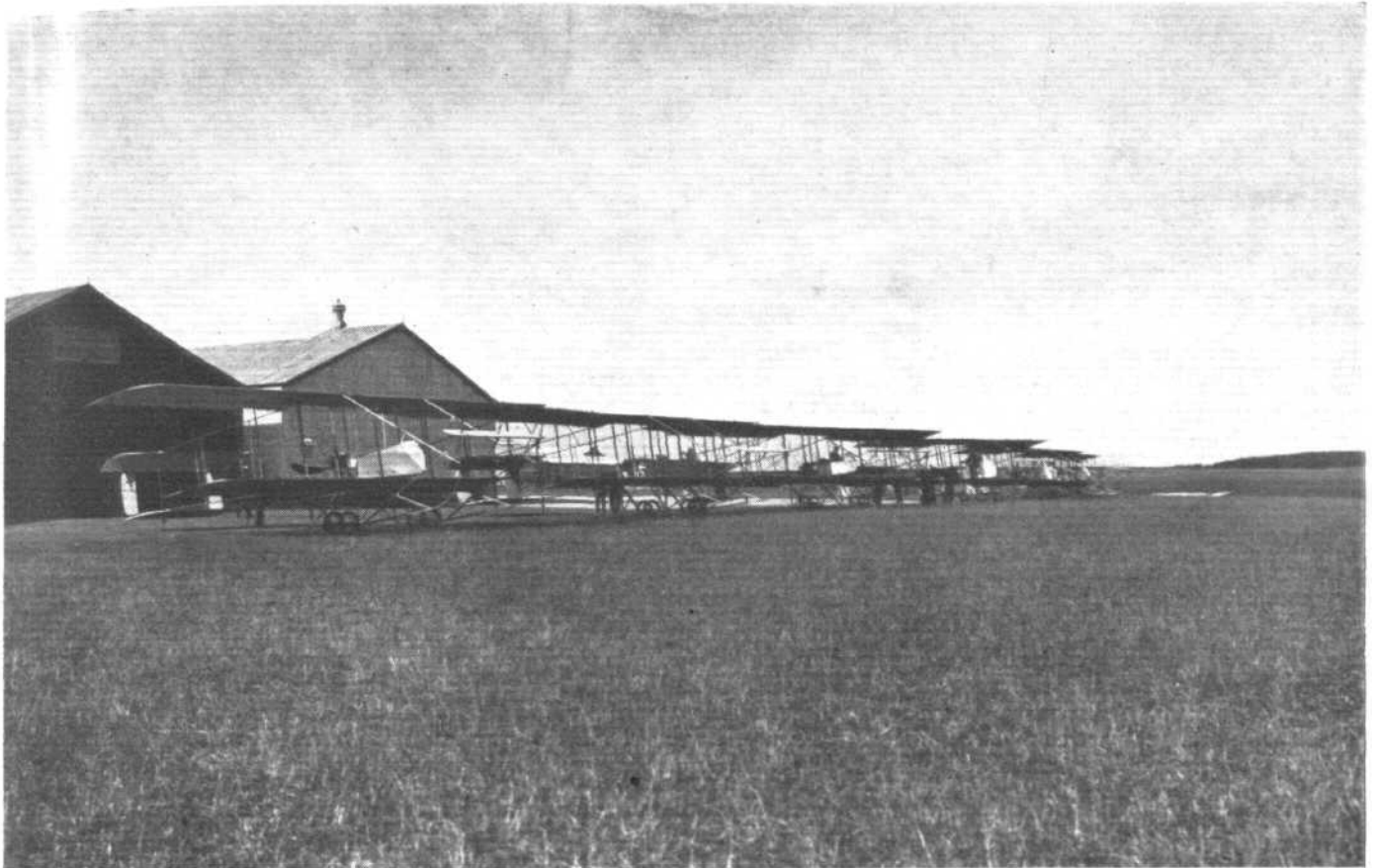
Every squadron seen at this Display, apart from the three mentioned above and the flying-boat squadrons, was formed during the war, and each has a history of war gallantry. In an article like this it is out of the question to give the history of each of the squadrons which takes part, or to mention all the different types of aeroplane



THE B.E.8: BEARING A STRONG FAMILY LIKE-NESS TO THE OTHER B.E. TYPES, THIS MACHINE WAS USED BY NO. 3 SQUADRON IN 1914.



MORE AIRCRAFT FACTORY PRODUCTS: THE B.E.12 (TOP) WAS USED, AMONG OTHERS, BY NO. 17 SQUADRON AT SALONIKA IN 1917. THE R.E.8 (BOTTOM) WAS A PHOTOGRAPHY AND RECONNAISSANCE MACHINE. AT ONE TIME IT WAS SAID TO BE DANGEROUS, BUT EXPERIENCE TAUGHT PILOTS HOW TO HANDLE IT.



THE ROYAL FLYING CORPS, MILITARY WING, 1914: THESE TWO PICTURES RECALL THE PRE-WAR DAYS OF THE R.F.C. AND SHOW (TOP) SOME OF THE MAURICE FARMANS OF "B" FLIGHT AND (BOTTOM) B.E. MACHINES OF "A" FLIGHT AT THE CENTRAL FLYING SCHOOL, UPAVON. ("FLIGHT" Photos.)



THE SOPWITH "TABLOID": THE FORERUNNER OF A LONG FAMILY OF MACHINES. THIS LITTLE SINGLE-SEATER MAY BE SAID TO HAVE LAID THE FOUNDATION OF THE FAME OF THE SOPWITH FIRM.



THE VICKERS "GUN BUS": THIS PHOTOGRAPH SHOWS THE "PROTOTYPE," AND WAS TAKEN BEFORE THE WAR. THE PILOT IS THE LATE MR. HAROLD BARNWELL.

which they have used in the course of their existence. FLIGHT from time to time publishes articles on various individual squadrons, giving an abstract of their history and photographs of the machines which they now use. It is not always realised how much the success of air operations depends upon the design of aeroplane used. Most people have heard of the "Fokker menace," when Mr. Fokker copied the general design of a French Morane monoplane, and, as a result, caused great havoc among the aeroplanes of the Allies. But it is not generally realised how throughout the war the fortunes swayed to and fro in the air, as first one side and then the other side produced a machine which had a better performance than those of the enemy. The pilots on each side were equally brave and equally skilful, but, on the whole, the machine which was the better at the moment got the upper hand. The war in the air was really fought out in the drawing offices of the aircraft manufacturers on both sides.

It seems to us now quite ludicrous that Great Britain should have gone to war with only four squadrons in the Royal Flying Corps, and those equipped with a heterogeneous lot of aeroplanes, two squadrons with the B.E. and two with mixed assortments. Yet that position had not been attained without a great deal of searching of heart. It was actually far more satisfactory than at one time had seemed likely or possible.



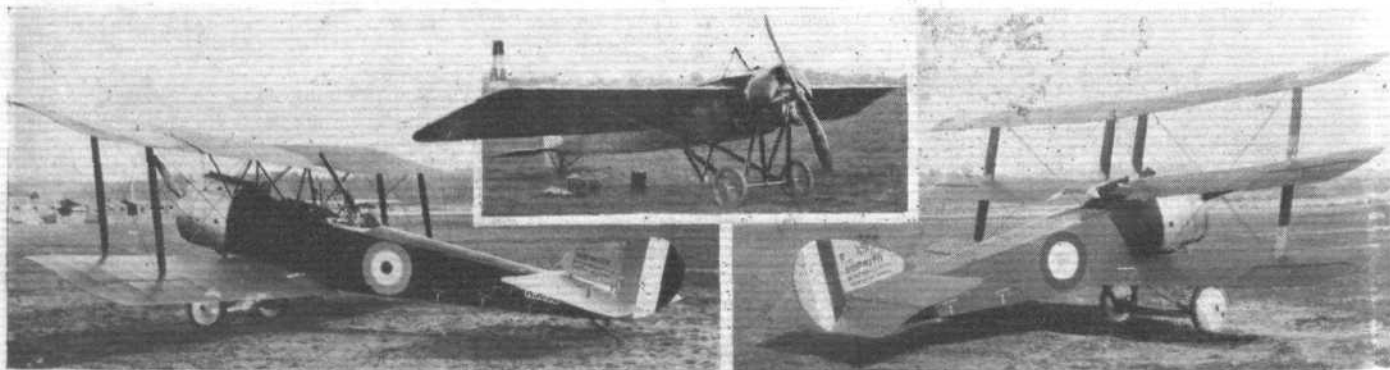
FIRST OF A LONG FAMILY: THE D.H.1 PUSHER TWO-SEATER WAS THE FIRST TYPE TO BE DESIGNED BY CAPT. DE HAVILLAND FOR THE AIRCRAFT MANUFACTURING COMPANY. (FLIGHT Photo.)

The Beginnings

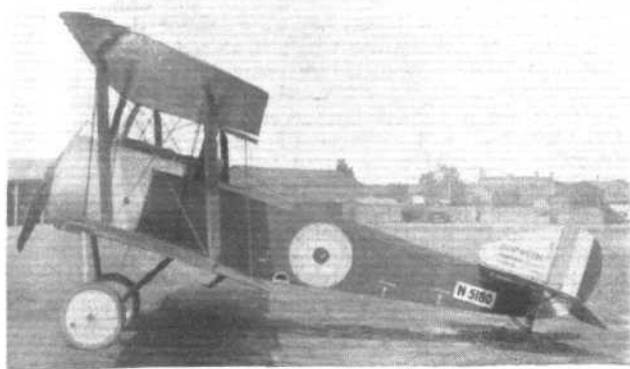
The Royal Air Force had its origin in some experiments made by the Royal Engineers with balloons in 1878. It is an old military saying that every General always wants to know what is on the other side of the hill. In the old days, scouts (usually cavalry) were sent to find out if they could. The scouts would naturally get on the top of buildings, climb trees, or even stand on their saddles in order to see as far ahead as they could. The great object was to get an extended view. The balloon was introduced with the idea of getting up still higher and so being able to see further. Of course, the balloons used were captive ones. So far as giving a long view went, it was, naturally, a success, but at first difficulties arose about communication between the observer in the balloon and the officers on the ground. About the only tactical success recorded to the credit of the balloon section of the R.E. was at the battle of Magersfontein in the South African war, when a balloon succeeded in turning the howitzers on to the enemy's mounts, which had been left some distance



THE BRISTOL SCOUT: DESIGNED BY FRANK BARNWELL, THIS LITTLE SINGLE-SEATER WITH ROTARY ENGINE DID GOOD WORK DURING THE EARLIER PART OF THE WAR.



THREE FAMOUS TYPES: THE SOPWITH 1½-STRUTTER (LEFT) WAS USED BY NOS. 43, 45, AND 70 SQUADRONS UP TO 1917. THE SOPWITH TRIPLANE (RIGHT) WAS USED EXTENSIVELY BY R.N.A.S. SQUADRONS IN FRANCE, AND HELPED TO BEAT THE GERMAN ALBATROS AND HALBERSTADT MACHINES. THE MORANE-SAULNIER MONOPLANE (TOP) WAS USED IN LARGE NUMBERS, AND WAS LATER COPIED BY FOKKER;



THE SOPWITH "PUP": A DESCENDANT OF THE "TABLOID," THE "PUP" SINGLE-SEATER WAS USED LARGELY, AND DID GOOD WORK AGAINST ALBATROS AND HALBERSTADT MACHINES.

behind in a position which was thought to be safe, with considerable effect. Sir Ian Hamilton, in his book about the Russo-Japanese war, noted that the Russians were using balloons, and added that, judging from British experience in South Africa, the Russians would now get some highly inaccurate information. Why the balloon had won this reputation does not appear. It certainly ought to have been able to see, even if it found difficulties in sending down prompt reports.

In the years 1903 to 1908 the art of flying aeroplanes was discovered in the three countries of America, France and Great Britain. It is not quite fair to say that our War Office treated them with a suspicion inherited from



"BORN 1913 AND STILL GOING STRONG": THE AVRO 504, WHICH BEGAN ITS CAREER AS AN OFFENSIVE AIRCRAFT EARLY IN THE WAR, LATER BECAME THE STANDARD TRAINING MACHINE. AMONG ITS EXPLOITS WAS THE BOMBING OF THE ZEPPELIN SHEDS AT FRIEDRICHSHAFEN. (Flight Photo.)

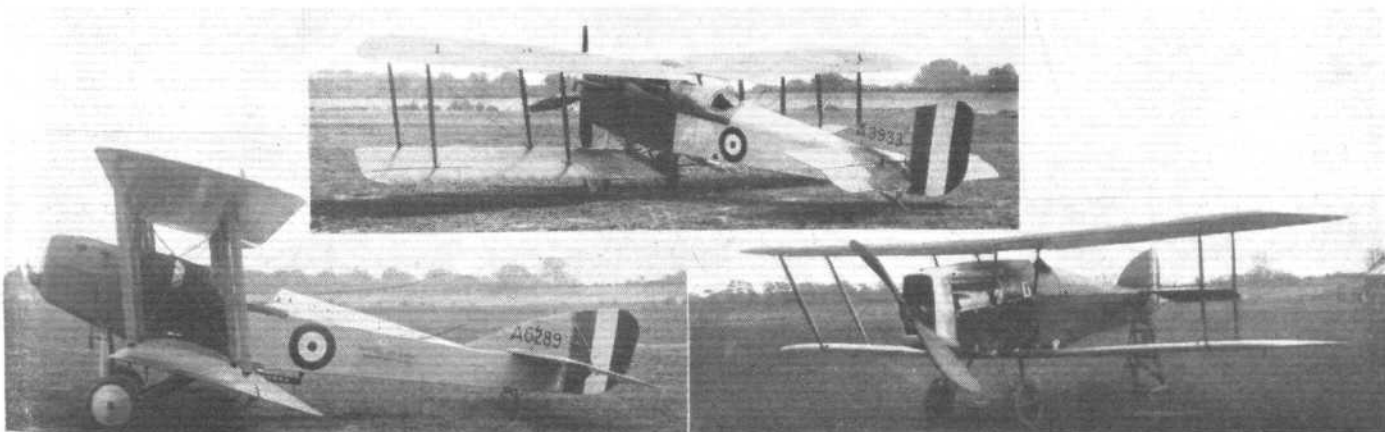
the days of the balloon. Actually it gave every possible assistance to Col. Cody in producing his machine. The early aeroplanes would just fly on a calm day, and not much more could be expected from them. Naturally the War Office was not so foolish as to adopt this new and undeveloped invention as the only reliable means of scouting. It proceeded with caution, giving the aeroplane reasonable encouragement, and waiting to see how it would improve, and whether it would ultimately prove of actual tactical value. The crudity of the early machines, and their dependence upon calm weather, was ample justification for this cautious policy. Aeroplanes are not now kept aground by high winds; but there are still days on which flying is very inadvisable, and in misty weather the man in the aeroplane cannot see so much of the enemy as can be discovered by a scout on the ground—that is to say, in open warfare. When there are continuous trench lines, then scouting must be done by aircraft if it is to be



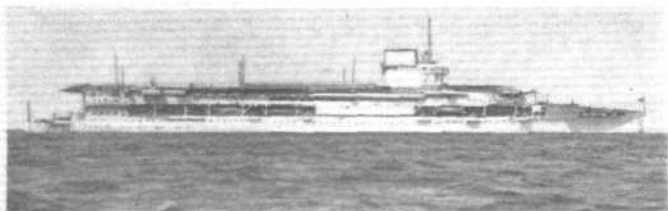
THE "BRISFIT": THE BRISTOL FIGHTER WAS ONE OF THE MOST SUCCESSFUL TYPES DURING THE WAR. IT WAS GIVEN TO NOS. 43, 45 AND 70 SQUADRONS IN 1917.

done at all. The Navy is in a better position; for if fog prevents the aircraft from seeing anything, it may still be possible to get some information by sending out destroyers. There can be no trench lines across the ocean. So, on the whole, the War Office was well advised to adopt a cautious policy about the new means of scouting; while the fact that the Army authorities did actually help on the movement and give it a chance to show what it could do proves that the War Office is not unresponsive to new ideas.

The balloon section of the R.E. came into existence in 1890, thanks to the good offices of Sir Evelyn Wood. On April 1, 1911, it was transformed into the Air Battalion, R.E. This was organised in two companies. No. 1 Company was in charge of balloons and airships and No. 2 Company dealt with aeroplanes. No. 2 Company later developed into No. 2 Squadron, R.F.C., while No. 1 Company was, at the end of 1913, handed over to the Navy. This explains why No. 2 Squadron is the senior squadron of the Royal Air Force. No. 1 Squadron had to be formed at a later date, after the outbreak of war. The first commandant of the Air Battalion was Major Sir



THREE MARTINSYDE MACHINES ON THE LEFT, THE G.100 (160 BEARDMORE ENGINE), FAMILIARLY KNOWN AS "THE ELEPHANT," THE TYPE F.1 (TOP) WAS THE FIRST OF THE F SERIES, AND WAS, THEREFORE, KNOWN AS "FATHER." IT WAS A TWO-SEATER, WITH 250 H.P. ROLLS-ROYCE ENGINE. THE F.3 WAS A SINGLE-SEATER FIGHTING SCOUT, AND WAS PRODUCED IN 1917. IT HAD A 190 H.P. ROLLS-ROYCE ENGINE.



THE EVOLUTION OF THE AIRCRAFT CARRIER: (TOP) BATTLESHIP H.M.S. "HIBERNIA," WITH PLATFORM OVER THE FOREDECK FROM WHICH THE LATE COMDR. SAMSON MADE SUCCESSFUL FLIGHTS IN 1912. (BELOW) H.M. AIRCRAFT CARRIER "GLORIOUS" OF THE PRESENT DAY.

Alexander Bannerman, who was a balloon expert. The officers of the battalion were appointed to it for a period of four years, and might come from any branch of the regular Army. The other ranks were all provided by the Royal Engineers.

The Royal Flying Corps

The next year, 1912, saw a big step forward. Aeroplanes were beginning to show progress in design, and the skill of the pilots in handling them was rapidly increasing. The Government of the day saw that this new feature of future wars needed serious treatment, and it also conceived the idea, albeit somewhat hazily, that flying would develop into something separate from both the Army and the Navy, though both services would have need of it. So a Royal Warrant constituted the Royal Flying Corps on April 1, 1912, and decreed that it should have a naval wing and a military wing. There was vision in this provision, though at first it proved abortive. The Admiralty never liked the arrangement, and persisted in disregarding the term R.F.C. (Naval Wing). It succeeded in getting the Royal Naval Air Service recognised in place of the other term. In consequence, the Royal Flying Corps became a purely Army unit, and the additional description "Military Wing" was gradually dropped as unnecessary.



OF FRENCH ORIGIN: THE NIEUPORT 11 PLANE (TOP) WAS CHARACTERISED BY A VERY SMALL LOWER WING. THE SPAD (BOTTOM) WAS A BLERIOT PRODUCT, BUT WAS ALSO BUILT IN ENGLAND.

While recognising the foresight of the Cabinet in providing for one flying service, one cannot deny the same quality to the Admiralty when it raised objections. The latter also looked ahead, and saw that naval air work meant a high degree of specialisation, and that naval defence could not be satisfactorily carried out unless the Admiralty had full control of its own air arm. The Admiralty point of view prevailed in 1913. There was a reversion to the other point of view in 1918 when the Royal Flying Corps and the Royal Naval Air Service were combined to form the Royal Air Force. Since then there has been an increasing tendency to allow the Admiralty to manage its own flying affairs. It may yet come about that each of the older services will again have complete control of its own air arm, while the Royal Air Force will concentrate on air defence and air control, and will also have possession of such ground units as searchlights, anti-aircraft guns and armoured cars, which are as necessary to air defence as aeroplanes are to naval defence or military defence. But that time has not yet come. At present a state of compromise prevails, whereby the Admiralty has the majority, but not the whole, of the responsibility for the Fleet Air Arm; while the War Office seems only too content to let the cost of the School of Army Co-operation and of the Army squadrons be borne on the Air Estimates.

No sooner was the Royal Flying Corps formed than a number of young officers applied to be seconded to it. They had to learn to fly first at their own expense and get a certificate from the Royal Aero Club before they could be appointed. A reserve was also instituted, and some officers who learnt to fly were placed on the reserve



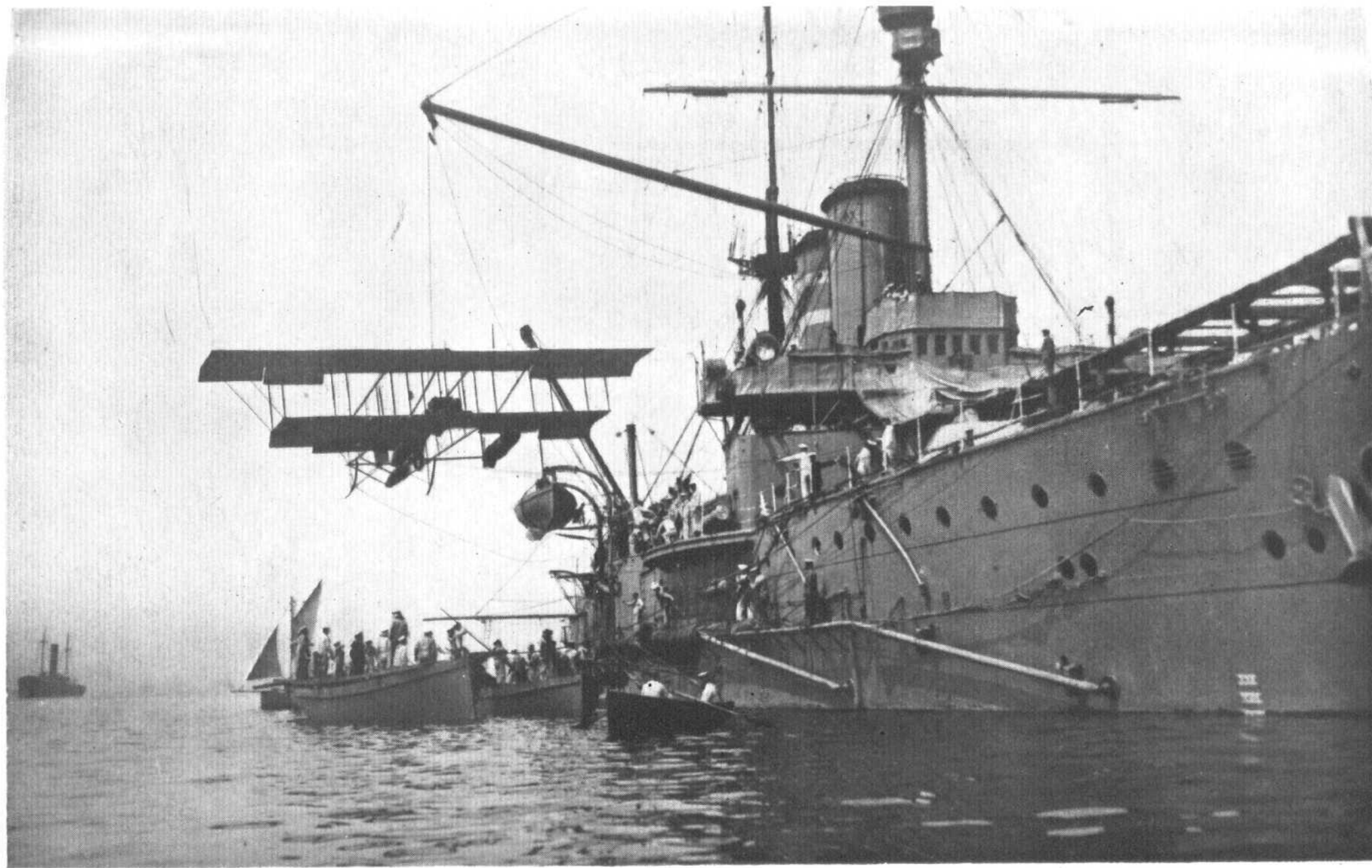
AN EARLY TORPEDO-PLANE: THE SHORT "225" SEAPLANE WAS USED EXTENSIVELY BY THE R.N.A.S. IT WAS FITTED WITH SUNBEAM ENGINE. (FLIGHT Photo.)



THE FIRST LARGE HANDLEY PAGE MACHINE: THE TYPE 0/400 WAS THE FORERUNNER OF A LONG SERIES OF LARGE BOMBERS. IT WAS USED BY THE R.N.A.S. AT DUNKIRK FOR NIGHT BOMBING OF BRUGES AND ZEEBRUGGE.



A BLACKBURN BOMBER: THE "KANGAROO" (2 ROLLS-ROYCE "FALCON" ENGINES) WAS DEVELOPED FROM THE G.P. SEAPLANE, AND WAS USED BOTH FOR BOMBING AND FOR SUBMARINE PATROL.



THE ROYAL FLYING CORPS, NAVAL WING: THE NAVAL WING, SUBSEQUENTLY KNOWN AS THE ROYAL NAVAL AIR SERVICE, CARRIED OUT MANY EXPERIMENTS WITH AIRCRAFT CO-OPERATING WITH THE FLEET. HERE WE SEE A SHORT BIPLANE (WITH FLOTATION GEAR) BEING HOISTED ABOARD H.M.S. "HIBERNIA," WHICH WAS EQUIPPED WITH A PLATFORM FROM WHICH AIRCRAFT COULD TAKE OFF.



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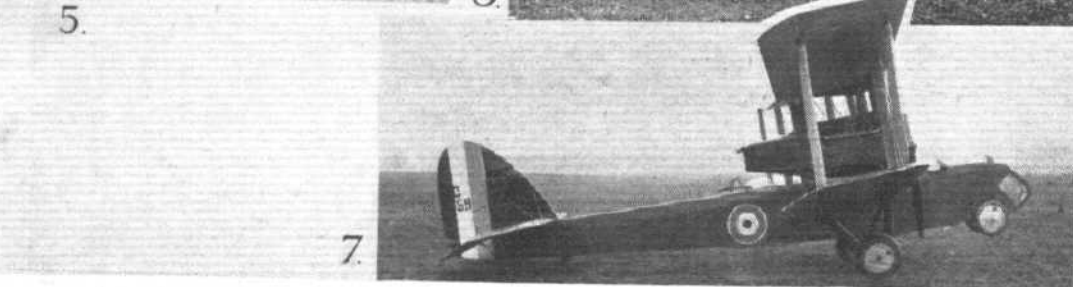
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MEMBERS OF THE DE HAVILLAND "FAMILY": 1, THE D.H.2, WAS A SINGLE-SEATER PUSHER WITH 100 H.P. Gnome MONOSOUPE ENGINE. THIS TYPE HELPED TO BEAT THE FOKKER MACHINES. 2, THE D.H.4, WAS FIRST FITTED WITH B.H.P., AND LATER WITH ROLLS-ROYCE ENGINE (3). IN 4, IS SEEN THE D.H.5, A SINGLE-SEATER FIGHTER WITH 110 LE RHONE ROTARY ENGINE. THE D.H.9, (5), HAD A SIDDELEY "PUMA" ENGINE. A LATER TYPE, THE D.H.9A, IS SHOWN IN 6. THIS HAD THE AMERICAN LIBERTY ENGINE. THE D.H.10, SHOWN IN 7, WAS A TWIN-ENGINE BOMBER.



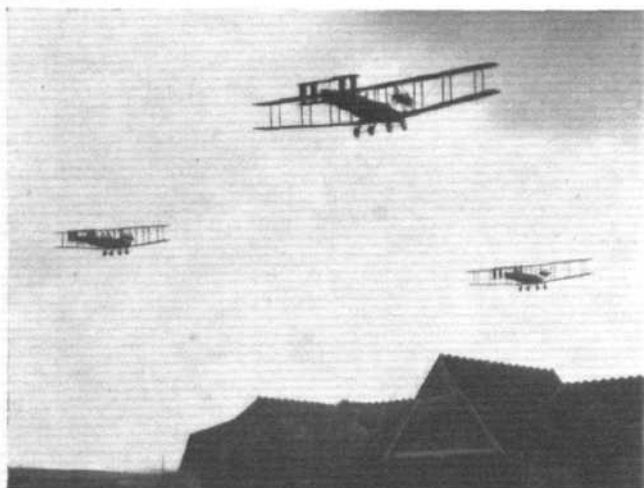
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SOME SUCCESSFUL SOPWITHS: THE CAMEL (1) WAS PROBABLY THE MOST SUCCESSFUL SINGLE-SEATER FIGHTER IN THE WAR. IT WAS USED IN BRINGING DOWN NO LESS THAN 1,281 GERMAN AEROPLANES. THE SNIPE (2) WAS ALSO A USEFUL TYPE, AND ON IT MAJOR BARKER, V.C., FOUGHT 60 GERMANS, AND SHOT DOWN 4. THE DOLPHIN (3), WAS DESIGNED FOR ALTITUDE WORK IN 1918. THE SALAMANDER (4), WAS DESIGNED FOR TRENCH FIGHTING, AND WAS ARMOUR PLATED TO PROTECT THE PILOT.



A MODERN AIRCRAFT CARRIER: A FAIREY III F ABOUT TO ALIGHT ON THE FLYING DECK OF H.M.S. "GLORIOUS." (Flight Photo.)



TOO LATE FOR THE WAR: THE HANDLEY-PAGE V-1500 FOUR-ENGINE BOMBER CAME OUT TOO LATE TO TAKE PART IN THE WAR 1914-1918, BUT WAS USED TO BOMB KABUL IN 1919, AFTER A FLIGHT FROM EGYPT TO INDIA VIA BAGHDAD. (Flight Photo.)

of the R.F.C., but in the meantime went back to their regiments. The four squadrons mentioned above were formed and proceeded to explore the possibilities of working with the Army. In the Army manoeuvres of 1912 both aeroplanes and airships took part. This was a great opportunity for the flying officers to learn how to help the troops, and for the generals to estimate the value of the help given. The aeroplanes in those days did not carry wireless (the sets of those days were much too heavy for the machines of those days), but the airship "Gamma" did carry an outfit and used it with great effect. After the manoeuvres, General Grierson wrote of the aircraft:—"The impression left on my mind is that their use has revolutionised the art of war. So long as hostile aircraft are hovering over one's troops all move-

ments are liable to be seen and reported, and therefore the first step in war will be to get rid of the hostile aircraft. He who does this or who keeps the last aeroplane afloat will win, other things being approximately equal.

The airship, as long as she remained afloat, was of more use to me for strategical reconnaissance than the aeroplanes, as, being fitted with wireless telegraphy, I received her messages in a continuous stream and immediately after the observations had been made."

These remarks by one of the ablest generals of the day (General Grierson unfortunately died while on his way to meet the Germans at Mons) are rather higher praise than one would have expected in 1912, when everything was in an experimental stage. They show, however, the urgent need for the development of fighting in the air. To get rid of the hostile aircraft was the first step in war, according to General Grierson, for otherwise every movement of troops was known to the enemy. In those days there was no means of getting rid of the hostile aircraft. Anti-aircraft guns were never very deadly, and there was nothing else until aeroplanes were enabled to shoot down other aeroplanes. That is why we now have the Bulldogs and the Furies—in fact, a whole Area (as it is called) of fighter squadrons.

The War

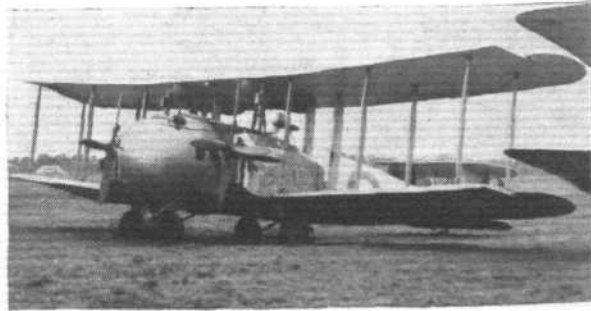
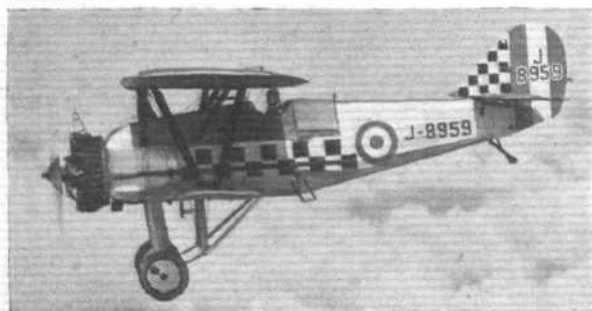
We come then to the period of the war. Our four original squadrons crossed to France with no other idea than that of reconnoitring for the Army. No. 4 Squadron when it went to France had a flight attached to it which was called a Wireless Flight, as its machines were provided with wireless equipment. Wireless is used for reporting, which is a branch of reconnaissance. Afterwards this flight was used as a nucleus from which our whole wireless organisation was developed. It was the exigencies of war which brought other work to the aeroplanes. Bombing began by throwing hand grenades over the side of the fuselage. Fighting began when the observers fired pistols and carbines at each other. Photography started by holding hand cameras over the side of the machine. Before the war was finished each of these branches of air work had been highly developed, and special machines had been designed for each class of work, and these were fitted permanently with suitable gear.



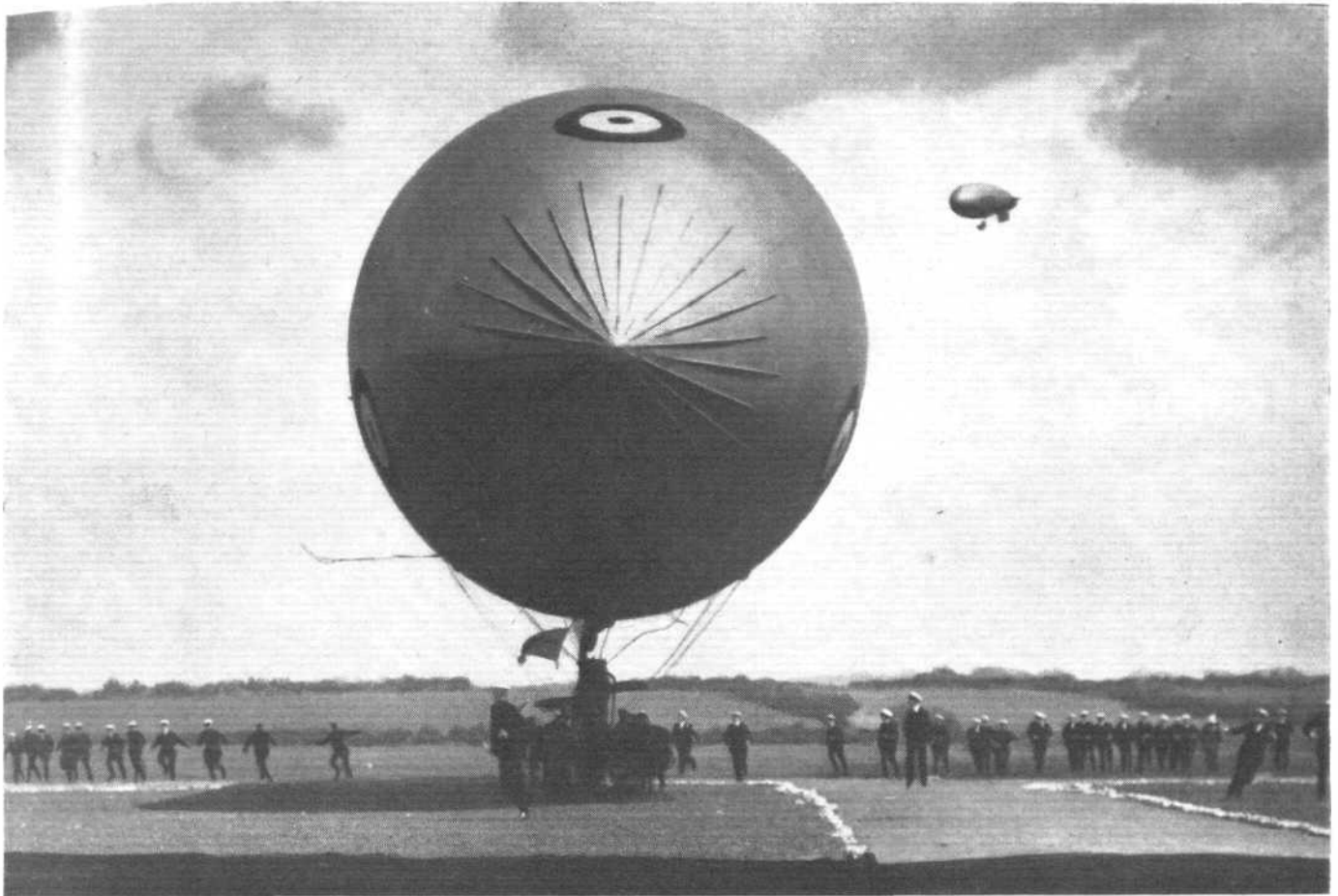
WARTIME FLYING BOATS: ABOVE, ON LEFT, THE TYPE F.3, AND ON RIGHT, THE F.5.



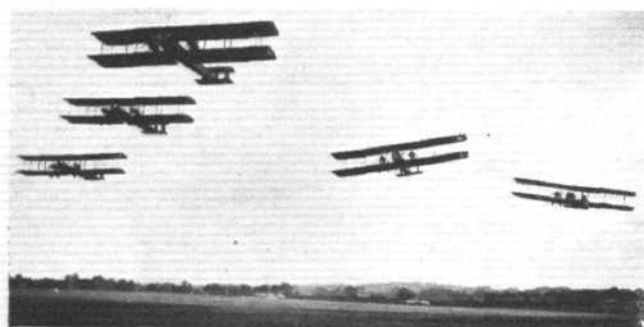
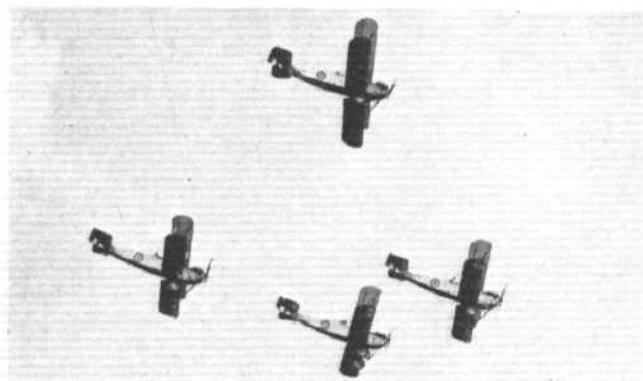
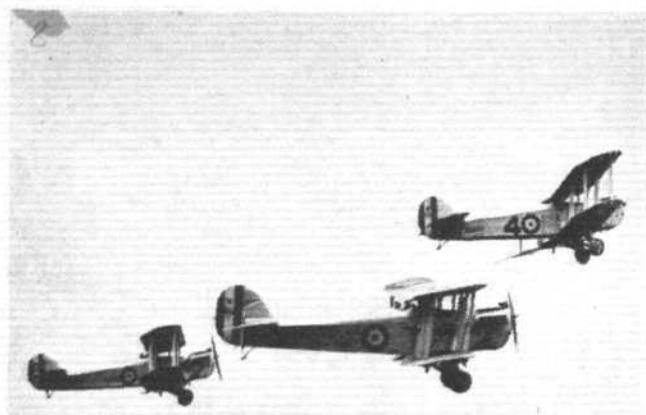
FIRST ATLANTIC FLIGHT: THE VICKERS "VIMY" (CENTRE) WAS USED BY ALCOCK AND BROWN IN FLIGHT ACROSS ATLANTIC IN 1919.



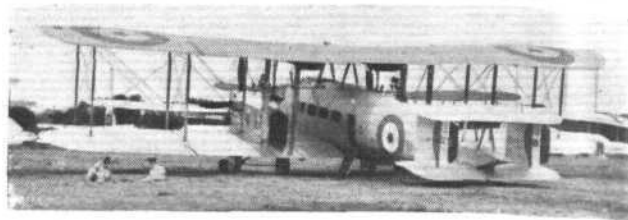
FIGHTER AND TROOP CARRIER: THE ARMSTRONG WHITWORTH "SISKIN" (LEFT) WAS THE FIRST ALL-METAL SINGLE-SEATER FIGHTER TO BE ISSUED TO THE R.A.F. THE VICKERS "VERNON" (RIGHT) IS A TROOP CARRIER, AND IS A DEVELOPMENT OF THE VICKERS VIMY-COMMERCIAL. (Flight Photos.)



AIRSHIPS: TWO PHASES OF WARTIME AIRSHIP DEVELOPMENT ARE SHOWN IN THESE ILLUSTRATIONS. AT THE TOP IS ONE OF THE HANDY LITTLE SUBMARINE SCOUT (ZERO) "BLIMPS" WHICH DID SO MUCH CONVOY WORK. BELOW IS ONE OF THE RIGID AIRSHIPS, R.23, BUILT BY VICKERS, LTD. IN 1916.



ON THE WING: TOP, A FLIGHT OF BLACKBURN "DART" TORPEDOPLANES. CENTRE, FOUR FAIRY III D'S. BOTTOM, A FORMATION OF VICKERS VIRGINIAS. (FLIGHT PHOTOS.)



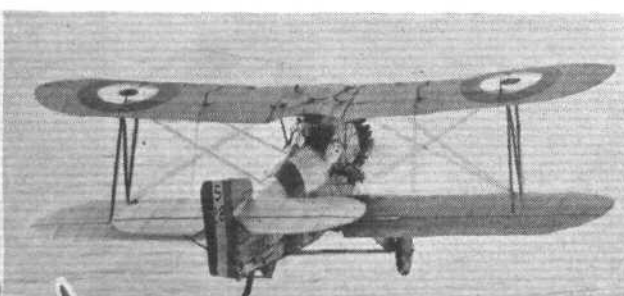
A LARGE TROOP CARRIER: THE VICKERS "VICTORIA" HAS ALSO BEEN USED FOR EVACUATING CIVILIANS FROM KABUL.

(FLIGHT PHOTO.)

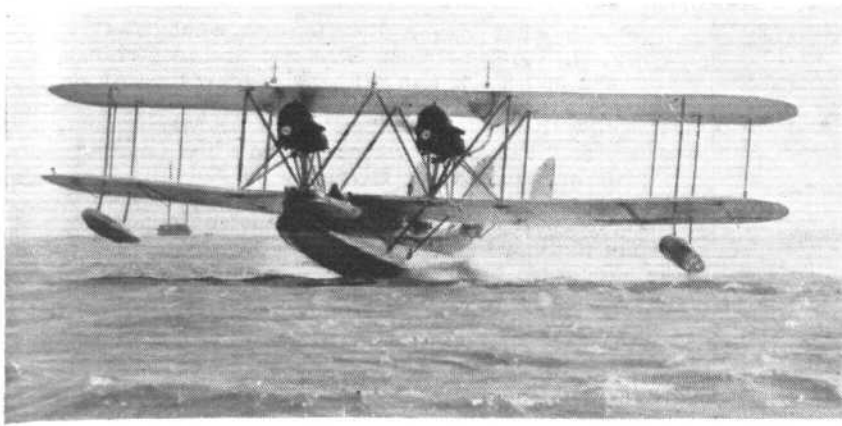
It is important to put air fighting in its proper place. The greatest honour was given to successful fighter pilots, and some people accordingly came to think that the great object of the air services was to win air combats. This is a mistaken view. The services which aircraft can perform for an army are, first, the original service of reconnaissance and reporting, which includes the use of wireless and photography; secondly, the bombing of the *matériel* and *personnel* of the enemy; and thirdly, close co-operation with the infantry and artillery in such ways as spotting for the guns, carrying messages, dropping supplies and attacking the enemy troops immediately in front. But none of these operations can be carried out unless the aeroplanes are free to fly where they list. Each side adopts General Grierson's maxim that the first thing is to get rid of the enemy's aircraft, and this is done by fighter machines, which in the time of the war were, most inappropriately, called "scouts." The object of a fighter is to destroy the reconnaissance and bomber machines of the enemy; but, in order to be free to do this, the fighters must also drive off the enemy's fighters which are protecting the said bombers and reconnaissance machines. So it came about during the war that the success of air operations depended very largely upon which side was for the moment getting the best of the fighting in the air. There is a glamour about air fighting. It recalls the single-handed duels of the knights of old. Also the fighter aeroplane has a special charm, because it embodies all the qualities which we most admire in an aeroplane, speed, climb, and manoeuvrability. But we must never forget that air fighting is only a means to an end. Nevertheless, the history of the war in the air is largely a history of how one type of fighter aeroplane outclassed its rivals for the moment, and was in its turn outclassed.

The Fokker Menace

The Royal Flying Corps was forced to turn its attention seriously to the question of fighting in the autumn of 1915.



VARIED PURPOSES: THE GLOSTER "GREBE" (1) WAS THE STANDARD SINGLE-SEATER FIGHTER WHICH SUPPLANTED THE SOPWITH "SNIPE." (2) THE FAIRY "FLYCATCHER" IS STILL THE STANDARD FLEET FIGHTER. THE AVRO "BISON" (3) WAS A "FLEET SPOTTER." THE AVRO "LYNX" (4) IS A TRAINING MACHINE. (FLIGHT PHOTOS.)



SEA AND LAND: THE SUPERMARINE "SOUTHAMPTON" HAS LONG BEEN THE STANDARD FLYING BOAT OF THE COASTAL AREA. THE HAWKER "WOODCOCK" (RIGHT) WAS A NIGHT FIGHTER TYPE. (FLIGHT Photos.)

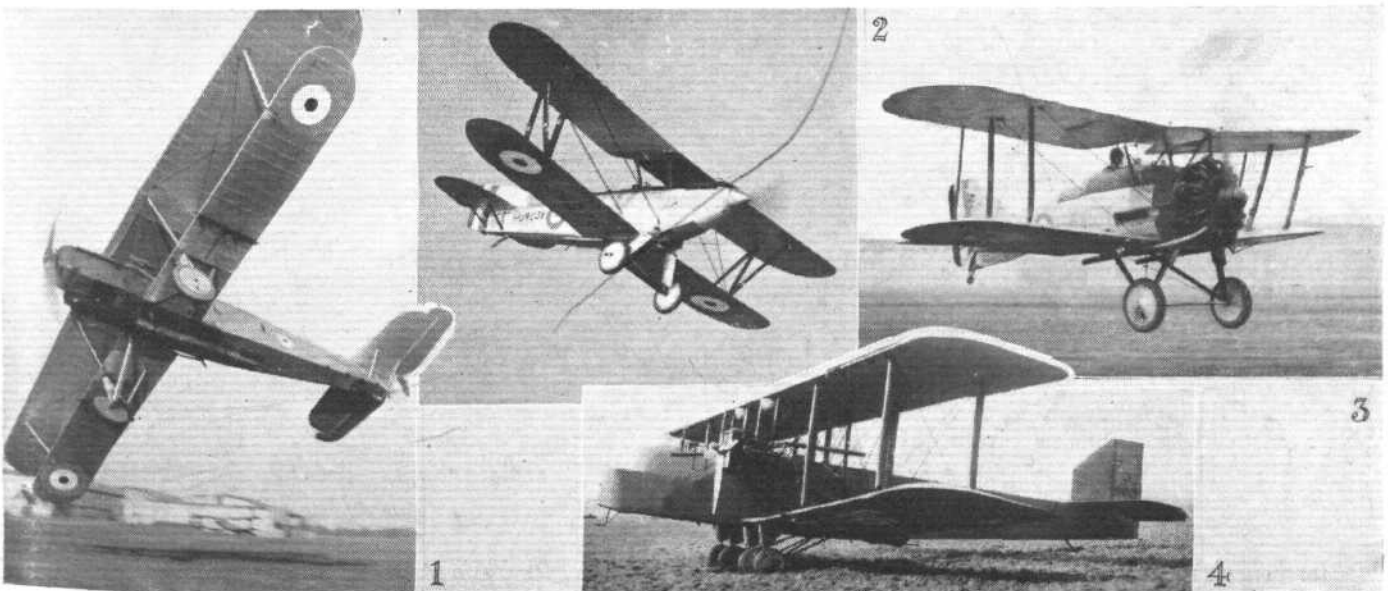
about the end of the battle of Loos, when suddenly there burst upon us what was known as the "Fokker Menace." Mr. Antony Fokker, a Dutchman, had done some good flying on a Morane monoplane, and when, during the war, he became an aeroplane designer on the German side, he produced a Fokker monoplane very much on the lines of the Morane, which it closely resembled in appearance. The chief point about the Fokker monoplane was that it was fitted with an interrupter gear, which permitted a machine gun to fire straight ahead through the disc of the propeller without any fear of the bullets hitting the propeller blades. This gave it a tremendous advantage in a fight. The tactics of the German pilots were to dive from a height on to an Allied machine, deliver a burst of fire at close quarters, and clear out of effective range before climbing to make another dive. Then the German officer, Max Immelmann, invented the climbing turn which still bears his name, which allowed a second diving attack to be made with very little loss of time. To these tactics of the Fokker, the British at that time had no effective reply. What they did do was to institute formation flying, so that each machine could give covering fire to the others. But the Fokker monoplane continued to be the terror of the air until the spring of 1916.

Beating the Fokker

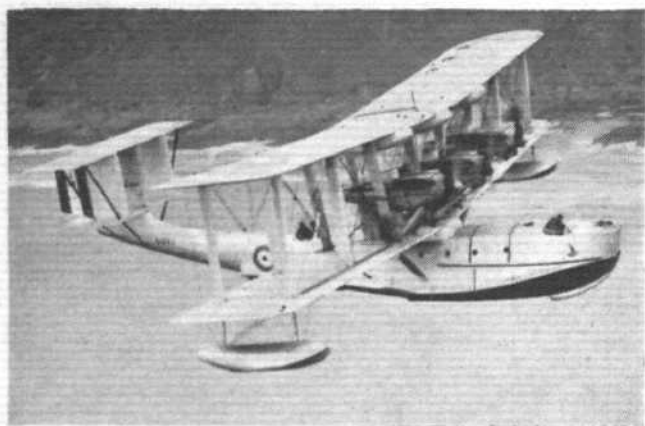
Early in the spring of 1916 two new types of British aeroplane began to arrive at the front, namely, the D.H.2 and the F.E.2B. D.H., of course, stands for the name of the designer, Capt. Geoffrey de Havilland, while F.E. means "Fighting Experimental." The former was a single-seater, while the latter was a two-seater. The

point about both of them was that they were of the type called "pusher," that is to say, that the engine was placed behind the pilot, so that there was an open field of fire for the front gun. The D.H.2 had a 100-h.p. monosoupape rotary engine, while the F.E.2B. had a 160-h.p. Beardmore. Both had a good speed for that time, and they were actually better fighting machines than the Fokker monoplane, which did not give the pilot a good view. The Morane monoplane, from which the Fokker was copied, had the same fault; it was rather "blind." In fact, the same could be said of most monoplanes in those days. No. 60 Squadron persuaded General Trenchard (against his better judgment) to let them have Moranes, and this squadron suffered very heavy casualties until it changed over to Nieuports. No. 24 Squadron was the first to arrive in France fully equipped with the D.H.2, and No. 20 Squadron was the first squadron to use the F.E.2B. Other fighter squadrons followed, and before long it was found that the Fokker menace was over. No small share of the credit must go to the Nieuport scout, a tractor machine with a gun firing over the top plane, which had the best performance of any machine of the day. In March, 1916, it was first supplied to Nos. 1 and 11 Squadrons. Capt. Albert Ball, V.C., was a pilot of No. 11.

In the summer of 1916 the great series of battles on the Somme was started, and the R.F.C. made a great effort to give the infantry all the help which could possibly come from the air. Our pilots were gloriously successful, and for months the Germans were pretty well driven out of the skies. Never at any time during the war had one side such a complete supremacy in the air over the other as we had during the early months of the Somme fighting.



OFFENCE: 1, IS THE HAWKER "HORSLEY" TORPEDOPLANE. 2, THE FAIREY "FOX" HIGH-PERFORMANCE DAY BOMBER WHICH SET A NEW FASHION. 3, THE GLOSTER "GAMECOCK" SINGLE-SEATER FIGHTER, AND 4, THE HANDLEY PAGE "HYDERABAD" TWIN-ENGINE NIGHT BOMBER. (FLIGHT Photos.)



THE BLACKBURN "IRIS": THIS FLYING BOAT OF ALL-METAL CONSTRUCTION, IS THE MOST POWERFUL MACHINE OF ITS TYPE IN USE AT PRESENT. (FLIGHT Photo.)

Boelcke and Richthofen

Naturally, the German high command was much exercised by the complete failure of its aircraft, and new schemes were considered for breaking the British air supremacy. Two new German fighters were available, the "Albatros" and the "Halberstadt," both very fast and good fighting aeroplanes. But it was realised that good machines needed pilots trained on a system, and that had hitherto been lacking in the German air service. A young Saxon pilot, Oswald Boelcke, who had made a name as a fighter pilot, was commissioned to raise and train a squadron of fighters. Boelcke's squadron, known as Jagdstaffel 2, was formed at the end of August, 1916. It was equipped with the Albatros type D, which had two fixed machine guns firing through the propeller, and this innovation, in addition to its fine flying qualities, made it the most formidable fighter aeroplane of the day.

There were heroes on the British side also during the Somme fighting. Capt. Albert Ball, V.C., in a Nieuport scout, was the greatest individual fighter of the day. He preferred to fly alone, but would unhesitatingly attack large formations of Germans, almost invariably with success. Then a Flight-Sergt.-Pilot of No. 29 Squadron, J. T. B. McCudden, flying a D.H.2, began to make a name for himself as a great air fighter. Later he won the V.C., received a commission, and reached the rank of Major.

Occasionally the champions of both sides met face to

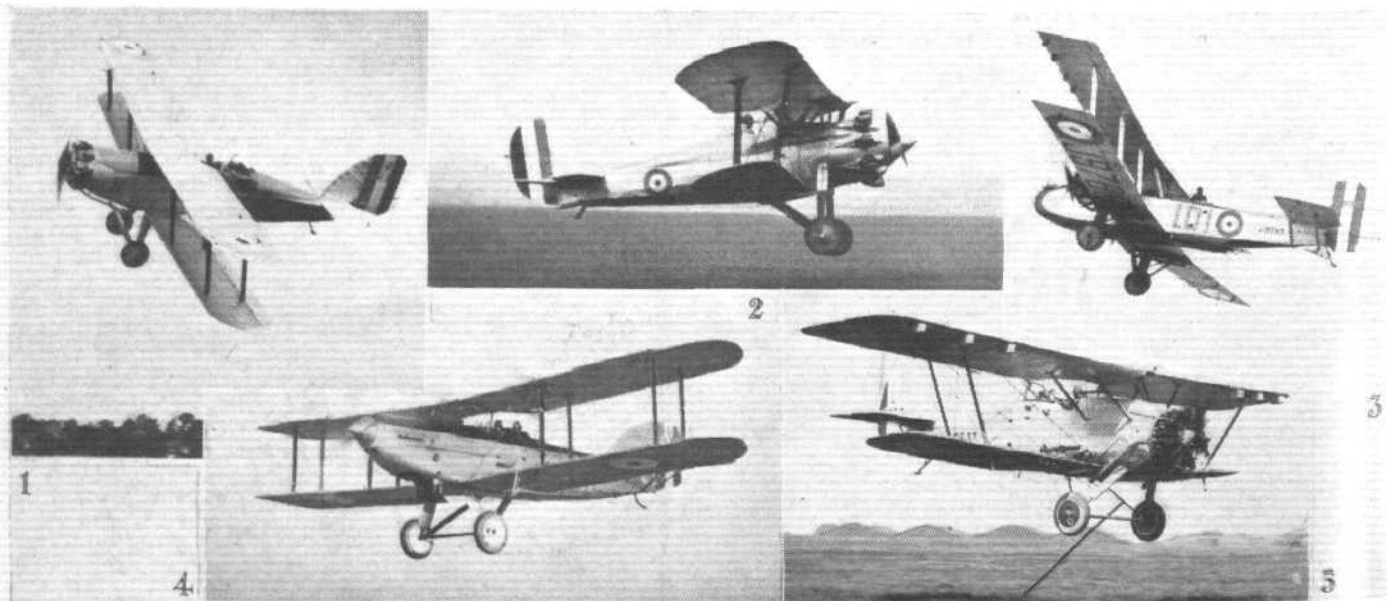
face in what was really Homeric combat. On November 23, 1916, between Bapaume and Albert, von Richthofen met Major Lanoe Hawker, V.C., the C.O. of No. 24 Squadron. Richthofen said that his Albatros had a slightly better climb than the D.H.2, and this enabled him to get above Hawker and drive him down. Once the Prussian had got the advantage of height, the result was certain. Hawker tried to get back to the lines by flying low and zig-zagging, but Richthofen followed and shot him through the head.

For some months the Albatros and the Halberstadt had the best of matters in the air, though the R.F.C. never admitted that it was beaten. Our fighters would always give battle to the German fighters, and our bombers and reconnaissance machines regularly crossed the lines to do their work for the service of the Army. Meantime our designers in England were constantly at work searching for a design of fighter which would be superior to the machines of the Germans. In May, 1916, the Sopwith "one-and-a-half-strutter" began to appear in France. It was a two-seater fighter with a 110-h.p. Clerget rotary engine, and had a forward gun which fired through the propeller by means of interrupter gear. This type was first served out to a flight of No. 70 Squadron, and later was widely used. At first it was extremely welcome, but it outlived its usefulness at the front, and before it was finally discarded our pilots had come to regard it as so much cold meat for the German fighters. During 1916 the Sopwith "Pup," a single-seater biplane with 80-h.p. Le Rhone engine, also began to appear at the front. It was a beautiful little machine to fly, and even when it was surpassed by later types, it was always beloved of our pilots. It held its own very successfully against the Germans, but it did not appear in numbers until 1917. Another successful Sopwith model was the Triplane, which was used chiefly by squadrons of the R.N.A.S., who came to France to help the hard-pressed R.F.C.

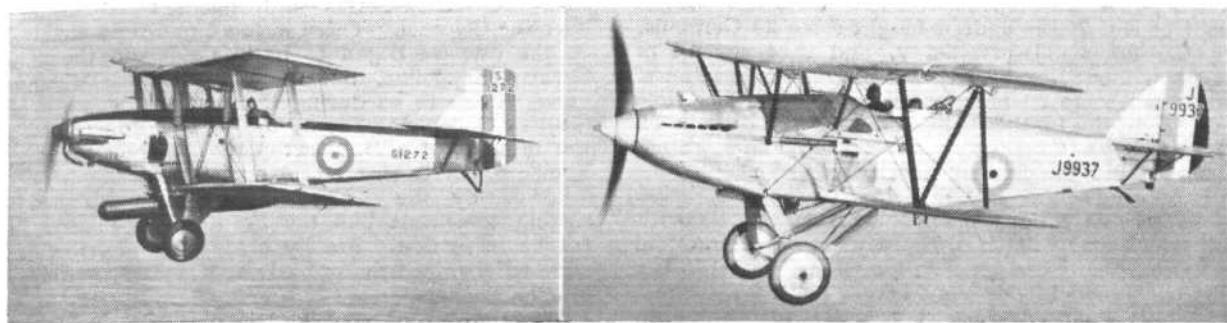
The Battles of Arras, 1917

The Battles of Arras opened in April, 1917. Great efforts had been made to increase the numbers of the R.F.C., and when the British attack opened, we were actually stronger in number of aeroplanes than the Germans. This was partly counteracted by the superiority of the German fighter aeroplanes. Our machines were shot down in great numbers. The Germans, however, preferred to fight on their own side of the lines, while we were equally determined to cross the lines. This added to the number of our casualties, especially in prisoners, but it also meant that our Army was getting better service from its air arm than the German Army got from theirs.

We had tried to spring some sort of surprise upon the Germans in the opening stages of this battle by keeping



IN THEIR ELEMENT: 1, THE WESTLAND "WAPITI" IS USED AS A GENERAL PURPOSE, DAY BOMBER AND ARMY CO-OPERATION MACHINE. 2, THE BRISTOL "BULLDOG" IS THE STANDARD SINGLE-SEATER FIGHTER OF THE R.A.F. 3, THE BOULTON AND PAUL "SIDESTRAND" IS THE ONLY TWIN-ENGINE DAY BOMBER TYPE IN USE. 4, THE FAIREY III F IS USED AS A GENERAL PURPOSE MACHINE, AND AS THE STANDARD FLEET SPOTTER. 5, THE ARMSTRONG WHITWORTH "ATLAS" IS THE STANDARD ARMY CO-OPERATION MACHINE IN THIS COUNTRY. (FLIGHT Photos.)



TORPEDOPLANE AND DAY BOMBER: THE BLACKBURN "RIPON" (LEFT) HAS SUPPLANTED THE "DART." THE HAWKER "HART" DAY BOMBER IS THE LATEST TYPE TO BE ISSUED TO SQUADRONS OF THE R.A.F. (FLIGHT Photos.)

our new types of aeroplane behind until the time for the offensive arrived. They were badly needed, for in April, 1917, the D.H.2 and F.E.2D. machines began to fall frequent victims to the Albatros and Halberstadt. We hoped much from the Bristol Fighter, and on April 5 a flight of six of these machines from No. 48 Squadron crossed the lines. They were led by Capt. Leefe Robinson, V.C., who was the first man to shoot down a Zeppelin on British soil. Near Douai they met Richthofen at the head of five Albatros fighters, and three of the Bristols were shot down. Leefe Robinson was taken prisoner. This was a great disappointment to us, and Richthofen's report greatly cheered the German air service. But the truth was that our men had not yet learnt to handle the Bristol properly. When they got familiar with it, it took great toll of the German machines. This fine two-seater actually remained standard equipment for the Royal Air Force until the beginning of the present year, though of late years it was used for Army co-operation work and not for fighting. The Nieuport, too, was now outclassed by the Albatros, partly because it had a Lewis gun, and the pilot had to stop fighting while he changed the drums of ammunition. During that month of April, 1917, Manfred von Richthofen himself shot down 31 British machines, and his brother Lothar, and Voss and Schäfer, and others also ran up large totals of British machines destroyed. On our side, Ball, Bishop, and McCudden shot down great numbers of machines, but they differed from the German champions in being for the most part single-handed fighters instead of working with formations. However, on May 7, in a general "dog fight," or *mêlée*, in the air, Ball was killed and Lothar von Richthofen was wounded and shot down. Ball was then in No. 56 Squadron, which had received the excellent S.E.5 machine with Hispano Suiza engine. The initials S.E. stand for Scout Experimental, and this fighter was among the best at the time on the Western Front. It is possible that towards the end of the dog fight Ball and the younger von Richthofen actually met in single combat, though it is not certain.

The Coming of the "Camel"

Good as the Albatros had proved, the Germans did not rest content. Mr. Fokker had produced a biplane after the monoplane, but this did not prove an outstanding success. In 1917 he produced a triplane, and this became a terrible instrument of destruction in the hands of Richthofen and his comrades. The elder von Richthofen had his own machine painted all red, while the other members

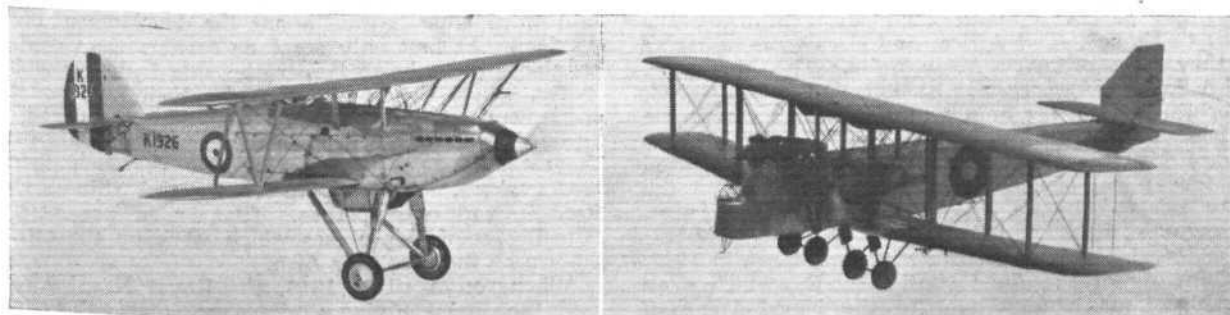
of his Jagdstaffel added some other colour to the red to make a distinction.

The British designers were also at work. The Sopwith firm had already done fine work for the R.F.C. It was now to do better. The "Pup" had been a success for a time, but speeds were increasing, and no machine could last as standard equipment at the front for very long. The Sopwith firm accordingly took the design of the "Pup" and improved upon it. The result was the famous "Camel." It got its name from the fact that, unlike most biplanes of the day, it had dihedral angle only on the lower planes, while the upper planes were flat. This produced an optical illusion, and when the "Camel" was in the air, it appeared to have a hump on its back. It had a 130-h.p. Clerget engine, which gave it a great advantage over the 80-h.p. Le Rhone in the "Pup." The "Camel" had a fair climb, good speed, and was exceptionally manoeuvrable.

"The 'Camel' was a fierce little beast," writes Capt. Norman Macmillan, once a flight commander of No. 45 Squadron, in his book, "Into the Blue." He goes on:—"She answered readily to intelligent handling, but she was utterly remorseless against brutal or ignorant treatment. She spun quickly, and was possessed of a sensitive elevator control, which was the pitfall of many a novice. Some of her vices became virtues in the battle 'aires,' where quick manoeuvre was invaluable. The 'Camel' turned very swiftly to the right—far more swiftly than to the left—a feature which was partly incidental to the big gyroscopic forces produced by the rotary engine. . . . It was mainly on this ability that she won her fame in fight, for the heavy stationary-engined German scout could not turn so fast, and, when they were engaged at close quarters, the 'Camels' could quickly outmanoeuvre them by maintaining the right-hand circle, in spite of the 'Camels' inferiority in climb and speed at even moderate altitudes."

By the time of the Armistice, 19 squadrons of the R.F.C. were using "Camels," as well as a number of R.N.A.S. units. In all, the "Camels" of the R.F.C. destroyed 908 enemy aeroplanes, and those of the R.N.A.S. shot down another 373. More than one Zeppelin and many enemy balloons were also shot down by "Camels." The "Camel" was used for fighting at night as well as by day, and destroyed 20 night-bombers of the Germans. It was also used for low bombing and for attacking enemy troops with machine-gun fire.

One of the greatest fights took place on April 21,



EXTREMES: ON THE LEFT, THE HAWKER "FURY," THE INTERCEPTOR FIGHTER OF THE R.A.F., AND ON THE RIGHT, THE HANDLEY PAGE "HINAIDI" TWIN-ENGINE NIGHT BOMBER. (FLIGHT Photos.)

1918, during the last great German advance. Seven "Camels" of No. 209 Squadron fought some 20 Germans, including the famous Jagdstaffel 2, and shot several of them down without losing any of their own machines. The fight lasted some 20 minutes, an unusually long time for a "dog fight." In this fight Manfred von Richthofen was shot dead by Capt. Roy Brown, and his all-red triplane fell behind the British trench lines.

There is only one more British fighter of the war period which need receive serious notice. This is the Sopwith "Snipe," which had a 230-h.p. Bentley rotary engine, and had a better all-round performance than the "Camel." The Snipe was concerned in one very heroic fight. The great Canadian pilot, Major W. G. Barker, set off in a Snipe on October 27, 1918, to fly from France to England. He was attacked on the way by about 60 German fighters. Had he been in a less perfect fighting aeroplane, he could scarcely have escaped. He was shot in both legs and in the left elbow, and his machine was badly damaged. But he shot down four German machines, three of them in flames, drove down two others in a spin, and broke up the enemy formation. He crashed on landing behind the British lines, but made a good recovery. This was the greatest fight which took place in the air in the whole war, and Barker was worthily rewarded for his gallantry and skill by receiving the Victoria Cross.

The Royal Naval Air Service

The history of the Royal Naval Air Service is more varied than that of the Royal Flying Corps. For that reason it is less easy to give a short *résumé* of its history. Whereas the R.F.C. started the war with one clear idea, namely that its aeroplanes must act as the eyes of the Army, the R.N.A.S. saw several objects before it. It does not seem at first to have envisaged the possibility of acting as the eyes of a fleet at sea. That idea came later, and in order to fulfil it some vessels were converted to act as seaplane carriers. But, it is disappointing to have to record, in the greatest sea battle of the war, Jutland, only one British seaplane carrier, the "Engadine," was present, and only one seaplane was sent up from her. The high command at that time had no faith in the efficacy of aerial reconnaissance, despite the good work which the Zeppelins were doing for the German Navy. The idea of the Admiralty seems rather to have been that its aircraft should act independently, and do work which surface ships were not able, or not available, to do. Watching the coast seems to have been considered the chief work of the R.N.A.S. in the early days of the war, and this developed later into organised patrols of the North Sea as well as of the English Channel.

The R.N.A.S. soon realised that reconnaissance over the seas could not be confined to mere observation. It saw that offensive action might easily become necessary, and so began to experiment with fitting machine guns to aircraft, and in carrying and dropping bombs, some time before the outbreak of war. As the Admiralty apparently had more money than the War Office had to spend on aircraft, the R.N.A.S. was better supplied with machines than was the R.F.C. on the outbreak of war, and their machines were fitted with more powerful engines. In August, 1914, the R.N.A.S. had in its possession 39 landplanes, 52 twin-float seaplanes, and seven airships. The fact that the naval service dealt with three distinct types of aircraft further complicates its history. Before long it added armoured cars to its list of fighting machines. The flying boat was a later addition, and a particularly useful one. Before the war was far advanced, the R.N.A.S. was obliged to come to the help of the R.F.C., first by making over numbers of aeroplanes which were needed more urgently by the Army, and later by sending whole squadrons to France, East Africa, and elsewhere, to act as though they were ordinary Army units. The history of the R.N.A.S., therefore, cannot be described as simple.

The service had its beginnings at Eastchurch aerodrome in the Isle of Sheppey, which was in 1911 the private property of Mr. (now Sir) Francis McClean. He offered to have four naval officers taught to fly there, and the Admiralty selected Lieuts. C. R. Samson, R. Gregory, A. M. Longmore, R.N., and Capt. E. L. Gerrard, R.M.L.I. When the Royal Flying Corps came into existence in 1912, No. 1 Company of the Air Battalion, R.E., which dealt with airships, was handed over to the Naval Wing of the Corps. Seaplanes and flying boats were developed entirely by R.N.A.S. officers.

Of the seven airships which belonged to the service at the outbreak of the war, three, the "Beta," the Parseval,

and the Astra-Torres did good reconnaissance work over the Channel. These were all non-rigid airships. Later in the war we began to build rigid, on the lines of the German Zeppelins, but it was non-rigids which were of most service to us during the war. First we evolved the S.S., or Submarine Scout, the first specimen of which had the fuselage of a B.E. aeroplane slung below it as a car. The S.S. Zero was a later improved model. It was followed by the "Coastal" type, which had internal rigging somewhat like the French Astra-Torres, and was trilobe in section. Finally came the "North Sea" type, also trilobe, which proved a most successful non-rigid airship.

When war broke out the naval squadron at Eastchurch was commanded by Wing Commander Samson, and was speedily sent across to Ostend. The machines were all landplanes, three B.E.'s, two Sopwiths, two Blériots, one Henry Farman, one Bristol, and a Short which had had wheels substituted for its floats. At first Samson found armoured cars more useful than aeroplanes, but none the less this proved to be the beginning of the R.N.A.S. station at Dunkirk, which did such excellent work in connection with the Dover patrol. Samson's squadron was then sent to the Dardanelles to spot for the guns of the fleet. In addition to this artillery observation, the aeroplanes undertook a certain amount of bombing of the Turkish communications, and even of their trenches.

Two very gallant raids on German airship sheds were undertaken by the R.N.A.S. in the winter of 1914. On November 21 four Avros flew to Friedrichshafen and dropped bombs on the Zeppelin sheds. A good deal of damage was done to the sheds, and two of the machines returned safely. Commander Briggs was brought down by machine gun fire and was made prisoner. On Christmas Day an attempt was made to bomb the sheds at Cuxhaven.

A detachment of the R.N.A.S. took part in the conquest of German South West Africa, using three steel Henry Farman machines with Canton Unné engines and two B.E.2.C. machines. Seaplanes played a still more important part in locating the raider "Konigsberg" in the delta of the Rufiji river in East Africa, and in directing the fire of the monitors on to her. In the subsequent campaign in East Africa one R.N.A.S. squadron and one R.F.C. squadron did most valuable work in keeping General Smuts informed of the movements of the German forces.

Not the least useful development of R.N.A.S. work was the patrol of the North Sea by flying boats working from Felixstowe and Great Yarmouth. Regular patrols were carried out by the boats, and few things could happen on that sea without being reported. The F.3 type of flying boat with two Rolls Royce 360 h.p. "Eagle" engines was the most successful flying boat. Twice boats caught Zeppelins unawares and shot them down in flames. There were also numerous fights between our boats and the German float seaplanes. These stations had landplanes as well as flying boats, and used them at night when Zeppelins were known to have crossed the coast. Three Zeppelins were destroyed by the landplanes of these two stations.

The float-planes and flying boats had many adventures apart from those of fighting. Engine failure meant an alighting on the sea, with a very problematical chance of being picked up. Carrier pigeons were always carried on the aircraft, and these saved a number of lives by flying home carrying messages which gave the locality of the crippled aircraft and enabled rescue parties to reach them. One boat with six men on board was afloat for over three days before it was rescued, thanks to the news taken to shore by a pigeon.

A word must be said about the development of aircraft carriers. At first only seaplane carriers were used. The seaplanes were hoisted over the side by a crane into the water, where they took off under their own power. Not infrequently the sea was too rough for the float-planes of those days to get off, and sometimes the floats gave way from the force of the waves. By degrees a flying deck was evolved, and landplanes, or rather ship-planes, were used instead of seaplanes. That is the present practice. The flights of ship-planes which work on the carriers are known as the Fleet Air Arm.

When, on April 1, 1918, the Royal Naval Air Service and the Royal Flying Corps were combined to form the Royal Air Force, the change was mainly regretted by the naval men, though it was rather popular with the R.F.C. officers. The present descendant of the R.N.A.S. is the Coastal Area of the Royal Air Force.

SPECIAL TYPES AT THE DISPLAY

A PART from the aircraft taking part in the actual R.A.F. Display, there will be at Hendon this year, as in previous years, an aircraft park in which will be collected a certain number of aircraft types of more or less recent production. These include military types which have not yet gone into general use in the R.A.F., and which are not, therefore, seen in action during the Display, except for the "fly past" in which they take part. They also include a certain number of civil aircraft types interesting for various reasons, and a few experimental, or as they are often called "research," types. In the following pages we give brief particulars of the different aircraft which will be exhibited in the Aircraft Park at this year's Display. It is pointed out that the performance figures given are, in some instances, very approximate only.

ARMSTRONG WHITWORTH A.W.XVI



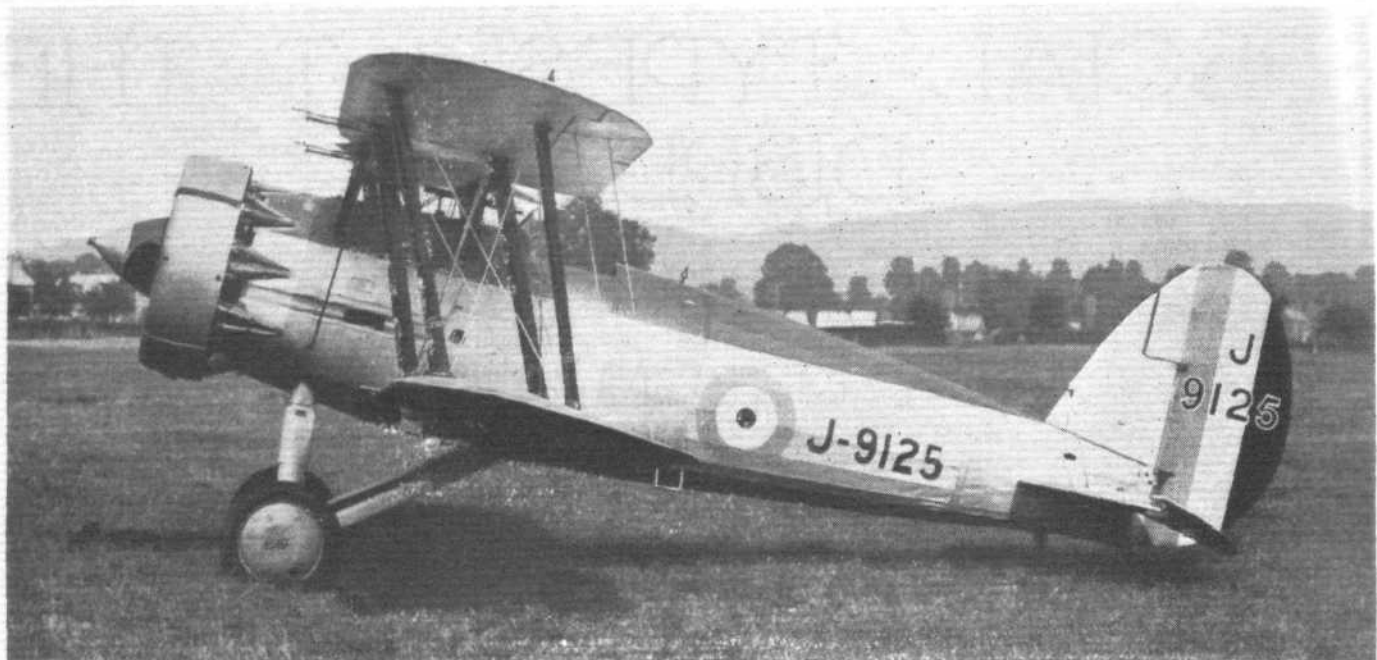
THE A.W.XVI is a single-seater Fleet Fighter, with 500-h.p. Armstrong-Siddeley "Panther" engine. The machine is of all-metal construction, and it will be observed that great care has been taken to streamline everything as much as possible. For instance, the wheels are partly enclosed in "spats" to reduce their drag, and the engine is fitted with a cowling ring, which materially reduces the air resistance of the large radial air-cooled engine.

Much research in the wind tunnel has been carried out. The A.W.XVI has a wing span of 33 ft. (10.4 m.), and the weight with full military load is 3,900 lb. (1,770 kg.). Sufficient fuel is carried for two hours' flying at full throttle, of which $\frac{1}{2}$ hr. at sea level and $1\frac{1}{2}$ hr. at 15,000 ft. (4,600 m.). The landing speed is about 62 m.p.h. (100 km./h.), and the estimated maximum speed at 15,000 ft. is 200 m.p.h. (322 km./h.).

THE GLOSTER S.S. 19

RESEMBLING in a general way its famous ancestors, such as the "Grebe" and "Gamecock," the Gloster S.S. 19 differs from these in that it is designed to carry an

unusually large armament, consisting of no less than six machine guns. Two of these are Vickers guns, mounted inboard in the ordinary way in the deck fairing of the



THE GLOSTER S.S.19, OR MULTI-GUN MACHINE IS ARMED WITH NO LESS THAN 6 MACHINE GUNS.
(Flight Photo.)

fuselage. The other four are Lewis guns, and are mounted inside the wings, some little distance outboard, with their muzzles projecting. There is a gun in each wing, i.e., one in the top starboard plane, one in the bottom starboard, one in the top port, and one in the bottom port wing.

The Gloster S.S.19 is of all-metal construction, and is

fitted with a 480-h.p. Bristol "Jupiter" VIII F. engine. The wing span is 32 ft. 10 in. (10 m.), and the total flying weight 3,468 lb. (1,575 kg.). The endurance is $\frac{1}{2}$ hr. at ground level, plus 1 hr. at 15,000 ft. (4,600 m.). The landing speed is 60 m.p.h. (96 km./h.), and the top speed 188 m.p.h. (303 km./h.).

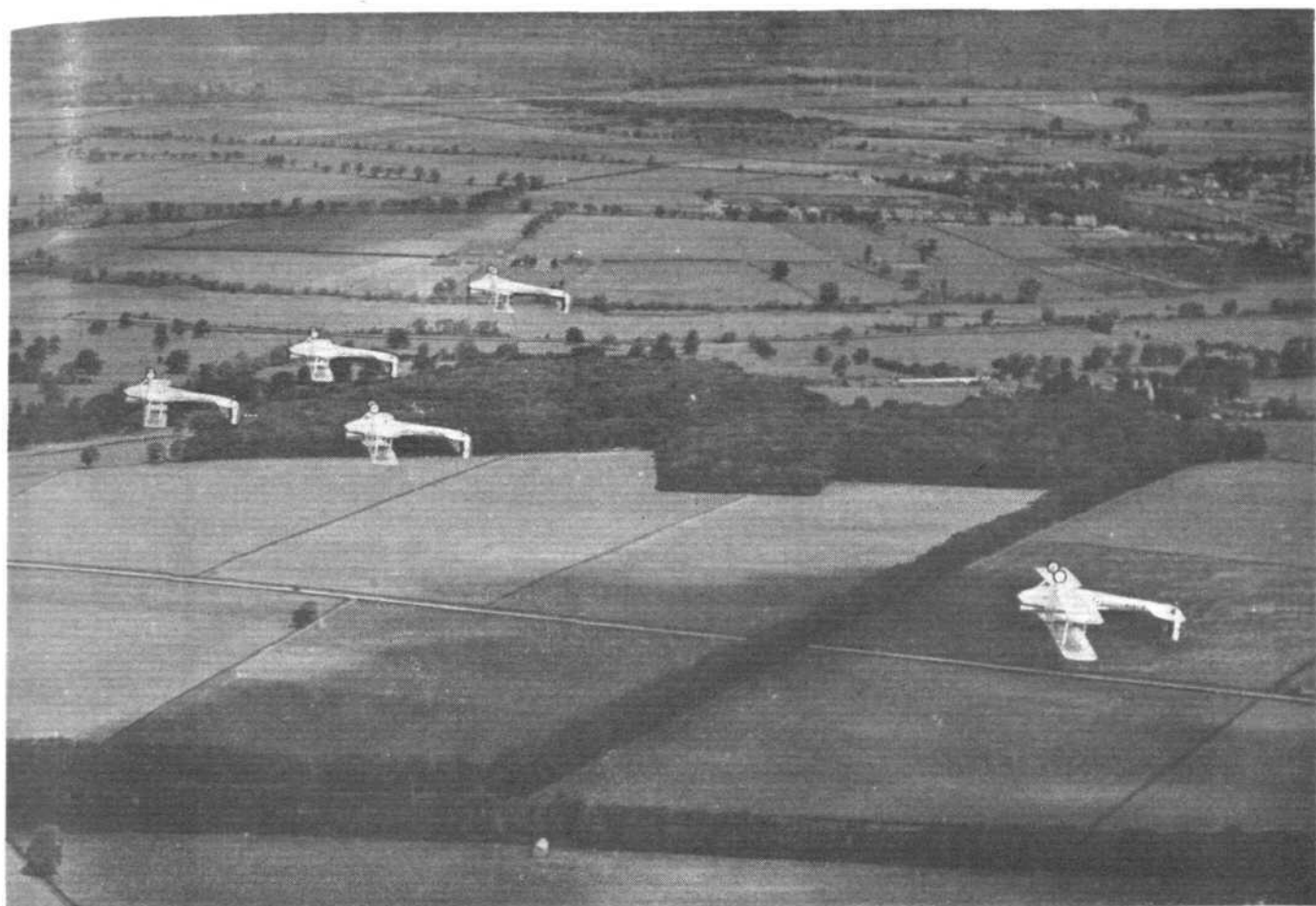
HAWKER "HOOPOE"



THE Hawker "Hoopoe" is an all-metal single-seater fighter designed to operate from a naval vessel. It is fitted with a 500-h.p. Armstrong-Siddeley "Panther III" engine (in our photograph a different engine is shown), and differs from the majority of single-seater fighters in that its biplane wing structure is of the two-bay type, i.e., it has two pairs of interplane struts on each side. This biplane arrangement results in a very rigid wing structure, and has been used in other Hawker

machines of the single-seater class, notably in the "Hawfinch."

The main data of the Hawker "Hoopoe" Ship's Fighter are as follow:—Wing span, 33 ft. 6 in. (10.2 m.); total flying weight, 3,500 lb. (1,600 kg.); endurance at full throttle, $\frac{1}{2}$ hr. at sea level, plus 2 hr. at 15,000 ft. (4,600 m.). The landing speed is 60 m.p.h. (96 km./h.), and the maximum speed at 15,000 ft. is approximately 200 m.p.h. (320 km./h.).



FORMATION FLYING BY CENTRAL FLYING SCHOOL INSTRUCTORS: THESE "GIPSY-MOTHS" WILL BE SEEN AT THE DISPLAY. IN THE LOWER PHOTOGRAPH, THE LEADER IS INVERTED, WHILE THE OTHER MACHINES ARE "RIGHT WAY UP." IN THE UPPER PICTURE ALL THE MACHINES ARE INVERTED.

(FLIGHT Photos.)

THE BRISTOL 118



ALL the latest forms of metal construction are incorporated in this entirely new Bristol machine. The 118 is a general purpose aircraft fitted with a Bristol "Jupiter X.F." engine of 480 h.p. From the photograph it will be noted that the fuselage is of very large cross-sectional area, which means that there is a great deal of room inside, a very desirable condition in a general purpose machine which has to carry an exceptionally large equipment. The wing bracing is unusual in that no wires

are used (except for centre-section struts). The undercarriage is of the "divided" type and the wheels are fitted with brakes.

The Bristol 118 has a wing span of 46 ft. 7 in. (14.2 m.), and its total flying weight is 5,200 lb. (2,360 kg.). The endurance is $\frac{1}{2}$ hour at ground level plus $2\frac{1}{2}$ hours at 15,000 ft. (4,600 m.). The landing speed is about 60 m.p.h. (96 km./h.) and the estimated maximum speed at 15,000 ft. is more than 160 m.p.h. (258 km./h.).

THE FAIREY "GORDON"



IN its general appearance and construction the Fairey "Gordon" resembles the famous Fairey III F, from which it has been developed. It is, however, fitted with the Armstrong Siddeley "Panther" II A engine of 500 h.p., whereas the standard Fairey III F is equipped with Napier "Lion" or Rolls-Royce "Kestrel" engines. The machine is primarily laid out as a small day bomber suitable for second-class warfare, but is also a general pur-

pose machine, fitted for desert operation in localities like Iraq, etc.

The Fairey "Gordon" has a wing span of 45 ft. 9 in. (14 m.) and a normal flying weight of 5,645 lb. (2,565 kg.). It has an endurance at full throttle of $\frac{1}{2}$ hour at ground level plus 3 hours at 15,000 ft. (4,600 m.). The landing speed is 65 m.p.h. (105 km./h.) and the maximum speed is 141 m.p.h. (227 km./h.).

SHORT "GURNARD" AMPHIBIAN



DESIGNED primarily as a seaplane to be catapulted from Naval vessels, the Short "Gurnard" amphibian to be shown at Hendon has been fitted with a land undercarriage, the wheels of which can be raised and lowered, according to the medium from which it is desired to operate. The engine fitted is a Rolls-Royce "Kestrel II," medium supercharged. The machine is a two-seater Fleet Reconnaissance Fighter. Short Brothers have had

considerable success with the single-float seaplane, a type which has been more popular in America.

The main data of the "Gurnard" are:—Wing span, 37 ft. (11.3 m.); total loaded weight, 5,500 lb. (2,500 kg.); endurance at full throttle, $\frac{1}{2}$ hr. at sea level, plus 3 hr. at 10,000 ft. (3,000 m.); landing speed, 54 m.p.h. (87 km./h.); estimated maximum speed at 10,000 ft., 132 m.p.h. (213 km./h.).

VICKERS 163

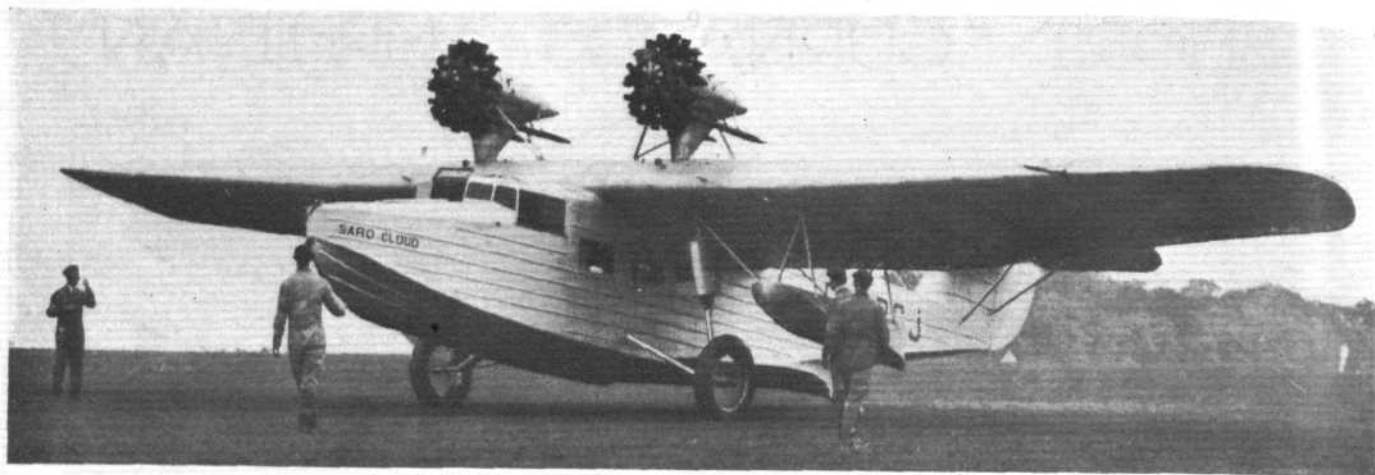


INTENDED as a replacement of the famous Vickers "Virginia," the Type 163 is a large four-engined night bomber, fitted with Rolls-Royce "Kestrel" engines. The engines are mounted in tandem pairs on "Y" struts between the wings, two engines driving tractor airscrews and two driving pusher airscrews. The machine can be used either as a bomber, in which case a crew of five is carried, and a heavy load of armament, or it can be used

as a troop carrier, in which case the crew consists of four men, with room for 21 men in the cabin. The 163 is of all-metal (largely duralumin) construction. Wheel brakes are fitted, and under the tail is a castor-action tail wheel.

The Vickers 163 has a wing-span of 90 ft. (27.4 m.) and a wing area of 1,918 sq. ft. (178 m.²). The total flying weight is 25,700 lb. (11,700 kg.).

No performance figures are available.



SARO "CLOUD"

AN amphibian flying boat for civil work, the "Cloud," is designed and built by Saunders-Roe, Ltd., of

Cowes, Isle of Wight. It has a hull of Duralumin and the wing is of wood construction. Fitted with two Armstrong Siddeley "Double Mongoose" engines, the machine carries eight passengers at a cruising speed of about 100 m.p.h. (160 km./h.). At this speed it has an endurance of 4 hours. The gross weight is 9,500 lb. (4,300 kg.).



"VIASTRA"

THIS is an all-metal commercial monoplane fitted with three Bristol "Jupiter VI" engines of 450 h.p. each. The covering of wing as well as fuselage is of metal (Duralumin), so that the machine can remain in the open for long periods without damage.

The cabin has accommodation for 12 passengers, and, in addition, the machine carries 800 lb. of luggage.

The "Viastra" has a wing span of 70 ft. (21.3 m.) and a gross weight of 12,950 lb. (5,900 kg.). The normal range is 300 miles (485 km.) at a cruising speed of 130 m.p.h. (210 km./h.). The landing speed is 66 m.p.h. (106 km./h.) and the maximum speed 152 m.p.h. (245 km./h.).

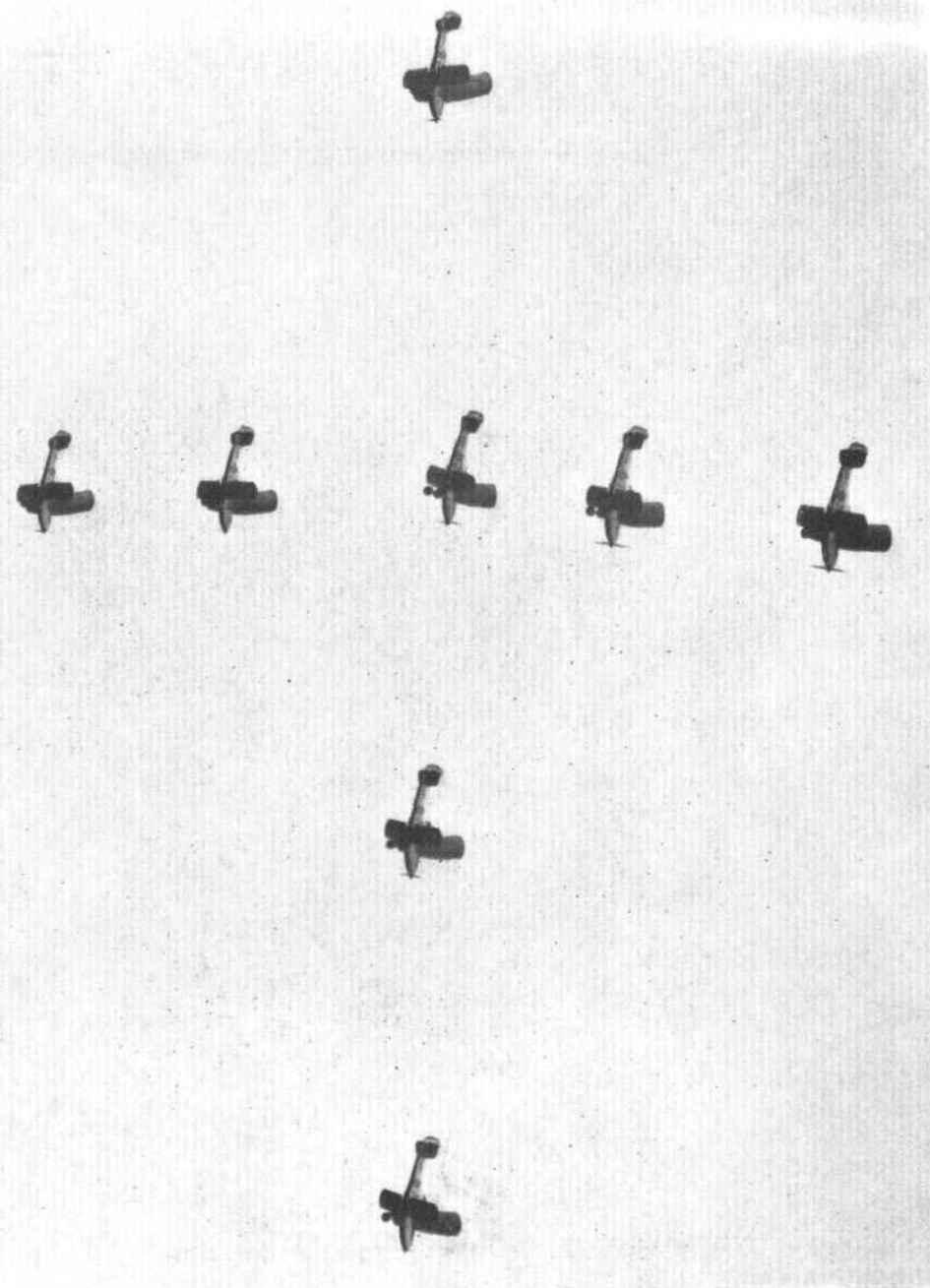
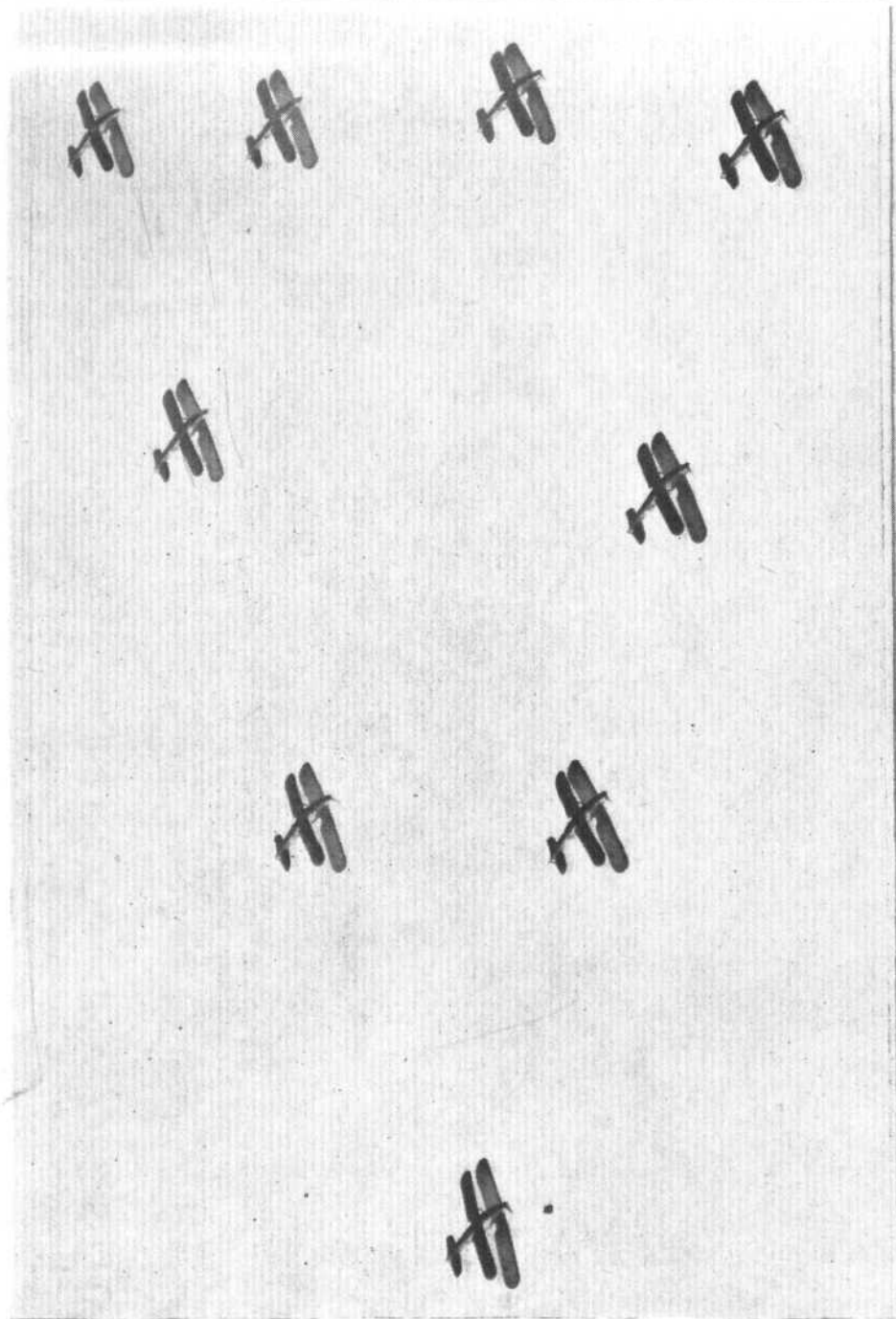


"WESSEX"

A SMALL commercial monoplane carrying pilot and five passengers. The engines (three) are Armstrong Siddeley "Genet Majors" of 140 h.p. each, and with full

load the machine has a cruising speed of 105 m.p.h. (170 km./h.). The type is very useful for "feeder lines," or for routes where the traffic is not very great.

The "Wessex" has a wing span of 58 ft. (17.7 m.) and a gross weight of 6,000 lb. (2,730 kg.). The landing speed is 58 m.p.h. (93 km./h.) and the maximum speed 118 m.p.h. (190 km./h.).



SOME NEW FORMATIONS WILL BE SEEN AT THIS YEAR'S DISPLAY: THE MACHINES IN THESE ILLUSTRATIONS ARE HAWKER "HARTS" (ROLLS-ROYCE "KESTREL") FLOWN BY NO. 12 (BOMBER) SQUADRON. (FLIGHT Photos.)

AVRO 626

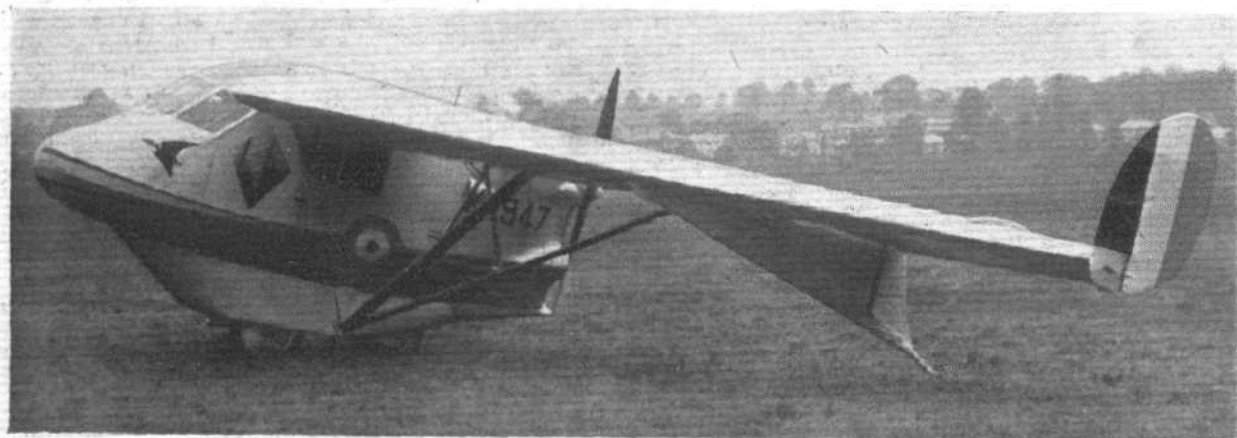


A VERY versatile machine is the Avro 626 Advanced Training type. It has been so designed that its equipment can be changed rapidly, if desired, so that the same machine can be used, in addition to ordinary flying training, for training in gunnery, wireless, photography, flying by instruments, etc. It is, however, rather intended that users should have one machine for each purpose, as this permits of simultaneous training in the various subjects. At the same time, the use of a standard type of machine has many advantages, as spares for engine and aircraft are the same for all models.

The Avro 626 is largely of metal construction, and has a welded steel tube fuselage. The engine fitted as standard is an Armstrong-Siddeley "Lynx IV" of 215 h.p., but, if desired, the machine can be supplied fitted with other engines of approximately the same power. The wings are staggered so as to give a good view.

The main data are:—Wing span, 34 ft. (10.4 m.); total flying weight, 2,750 lb. (1,250 kg.); endurance at full throttle, 1 hr. at ground level and 2½ hr. at 10,000 ft.; landing speed, 45 m.p.h. (72 km./h.); maximum speed, 110 m.p.h. (177 km./h.).

WESTLAND "PTERODACTYL"



THIS machine is a development of the "Pterodactyls" shown at previous Displays. Designed by Captain G. T. R. Hill and built by the Westland Aircraft Works, the Mark IV is a three-seater cabin machine, fitted with the 120-h.p. "Gipsy" inverted engine.

The "Pterodactyl" has no tail, the back-swept wings giving the fore and aft stability attained in orthodox machines by means of a tail. The ailerons perform the functions of fore and aft and lateral control. Used to-

gether they act as elevators, while used in opposition they act as normal ailerons. Directional control is by the rudders on the wing tips.

The "Pterodactyl IV" has the inverted "Gipsy III" engine mounted at the back of its fuselage and driving a pusher airscrew. The gross weight is 2,000 lb. (910 kg.), and the maximum speed 110 m.p.h. (177 km./h.). The endurance is 4½ hr. at a cruising speed of 90 m.p.h. (145 km./h.).

"AUTOGIRO" AND "GUGNUNC"

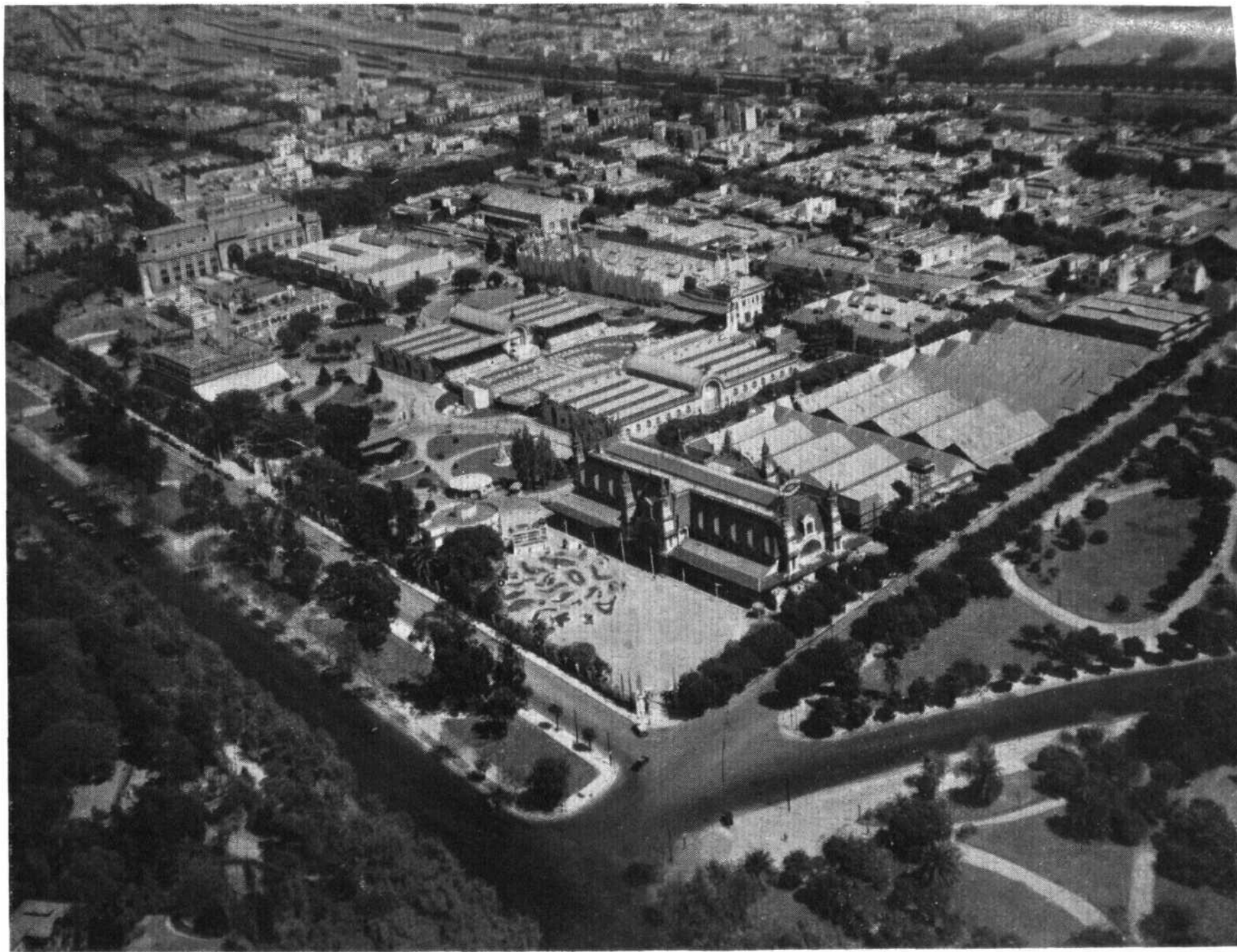
IN the aircraft park will also be a Cierva "Autogiro" two-seater fitted with Armstrong-Siddeley "Genet Major" engine of 115 h.p. This machine has been seen at previous Displays, and it will be remembered that most of the lift is obtained from the blades of the rotor. The "Autogiro" has a low speed of about 28 m.p.h.

(45 km./h.), and a top speed of 82 m.p.h. (132 km./h.). A photograph will be found on p. 573 of this issue of FLIGHT.

The Handley Page "Gugnunc" machine was designed for the Guggenheim competition in America, and has already appeared at the R.A.F. Display. Except for the fact that it always causes much merriment, it is difficult to see why this machine is included.

**THE BRITISH EMPIRE
EXHIBITION AT
BUENOS AYRES:**

This aerial view was taken
by "Acrovisitas" of
Buenos Ayres, who use
the De Havilland Moth
originally flown by Broad
at Orly. The machine
is still going strong.



Airport News

CROYDON

IMPERIAL AIRWAYS, LIMITED, have entered upon a very unlucky period, especially on the Indian and African sections of their routes. G-EBLO crashed this last week, on the African section, and it has been necessary to rush another Argosy to Africa from Croydon. G-EBLF has now been sent out, and this is the last of the original Argosies; all of these machines are now doing valuable service out East. This incidentally reduces the European section to a skeleton establishment of aircraft. It is no use trying to disguise the fact, Imperial Airways, Limited, are lamentably short of flying stock. It is to be hoped that the machines on order will soon be delivered to Croydon. Hannibal II is nearing completion at Radlett, and a second Avro X has just been delivered. The fare-paying public expect to be carried to time, with machines at disposal for all emergencies. It is to be hoped the services can be maintained as advertised, but it will be a colossal task to do so unless some of their new machines put in an appearance very shortly. Hannibal developed tail trouble in Paris on Thursday and was almost on the point of taking-off before it was discovered. There certainly seems to be a weakness at this point, but it will no doubt be remedied in due course. The pilot, Mr. Rogers, thought rather seriously of the defect, and decided to return to Croydon as a passenger by Air Union—'Nuffsaid.

Frank Hawks has been busy this last week, to and from Rome. On Monday he arrived from Rome in five and a-half hours. Not content with this, he made a return trip on Wednesday in just over nine hours. He has now promised himself a holiday, to see a few of the sights of England, before he sails for New York this week. Capt. Hawks has made himself a very popular figure on this aerodrome during his short stay, and we shall always be pleased to welcome him back again.

On Thursday, Miss Maryse Hiltz, one of the few French lady pilots, arrived from Paris on a De Havilland Moth, *en route* for Stag Lane.

Private Aerodromes in Ireland

THE HONOURABLE A. E. GUINNESS is the owner of one of the finest private aerodromes in the British Isles and it is to be found in County Dublin, on his estate near the city. Recently a larger area was converted into a landing field and a big hangar erected; in the past, Mr. Guinness and his pilot, Capt. Allison, only used this field for the Moth or Cutty Sark, but Irish pilots are now looking forward to see what the latest acquisition is that it should require so large a landing ground and hangar. Mr. Guinness has also provision for his flying-boat at Cong, County Galway, and as a member of a prominent Irish yacht club is entitled to a mooring in Dun Laoghaire Harbour. Another private aerodrome is said to have been established on the estate of Senator Dr. Oliver, St. John Gogarty, near Oranmore, County Galway, the Senator is a keen pilot and intends to have a number of aerial visitors to his country home in the near future. Several of the hotels situated near the beauty spots of Ireland are considering the necessity for establishing an aerodrome or, at the least, a field suitable for landing in the vicinity of the hotel. Ireland has aroused itself at last! Senator Alfred Byrne, Lord Mayor of Dublin, in discussing municipal airports

A large number of air taxis and private owners passed through *en route* for the motor races at Le Mans, early in the week. Mention of races—Sunday, June 28, should see the usual rush for the French Grand Prix, when numerous day excursions will leave Croydon in the morning and return late in the evening.

The Deutsche Luft Hansa are very busy with their freight service, and almost every day it has to be duplicated. The night freight machines are always full to capacity. These night services are running with clockwork regularity, and recently it certainly has been the best time to fly, from a weather point of view.

We have had a sample of nearly every kind of weather again this week.

Rollason Aviation Company, and Personal Flying Services, have been very busy with their special charter departments making trips to Ireland.

A party of 250 people, representing the Perthshire Association in London, visited the aerodrome on Saturday last, headed by Lord Amulree, who is himself a Perthshire man. Some aerodrome wit suggested engaging Mr. Stirling, the engineer-superintendent of Imperial Airways, Limited, to act as interpreter.

Cirrus-Hermes Engine Company continue selling their Hermes product to all parts of the world. Their successes in the recent London—Newcastle race, the first four machines home were fitted with Cirrus-Hermes engines, and the Society of British Aircraft Constructors' Challenge Cup at Bristol on Saturday last, prove how well they are doing here at home.

The traffic and freight figures continue to increase enormously.

This, of course, is the time of the year we expect to be busy. The traffic figures for the week were:—Passengers, 2,001; freight, 86 tons.

P. B.

with our representative recently, said that at present such a project would not be possible for Dublin, as the people were not sufficiently airminded.

Heston Air Park

SATURDAY, June 20, was the inaugural day of the Heston Verandah, the new public enclosure, which has been constructed at Heston Air Park to the design of Mr. Graham Dawbarn, F.R.I.B.A.

Based on the principle which has proved so successful at the Tempelhof Aerodrome, the enclosure provides teas and refreshments in pleasant surroundings. An excellent view of the aerodrome and flying activities is obtained from the building, and musical entertainment is provided by an electrical gramophone.

Joy rides are given, at 5s. per head, in the latest type "Puss" Moth from 5 p.m. onwards on week-days and from 2 p.m. on Sundays. These proved a great success on the opening day, and the machine was kept busy all the afternoon. Captain T. Neville Stack gave an aerobatic display and Captain V. H. Baker an exhibition of crazy flying. Admission to the enclosure is 6d., and teas, coffee, ices, etc., are provided at very low charges.

The Autogiro at Geneva

FLIGHT-LIEUT. RAWSON gave a demonstration of the Autogiro at Geneva on June 20, his almost vertical descent causing considerable interest.

Airship Sold by Auction

THE small airship, the property of the Airship Development Co., Ltd., of Cramlington, Northumberland, was sold by auction at Cramlington on June 18. The airship was built in 1929 and had a length of 137 ft. Two gas envelopes, each of which cost £1,000, were sold for £22 10s., to be made into dust-sheets at a furniture repository. A 75-h.p. Rollis-Royce "Hawk" engine, which cost £1,000, was sold for £13 10s., and is to propel

a motor-boat at Whitley Bay. The gondola, complete with instruments, was bought for £2 by an engineer as a curio. Parachutes were sold for £17 each, and a complete electric lighting set was disposed of for £20.

R.A.F. Display at Andover

A FORETASTE of Hendon was given at Andover on Friday, June 19, when units of the Royal Air Force gave an excellent display there. Twelve of the items which will be shown at Hendon on Saturday were given at Andover. The enjoyment of the afternoon was marred by heavy rain. As we shall be giving a full description of the events at Hendon we forbear from further description of Andover, except to say that the performance was extremely good.

Correspondence

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

WIND TUNNEL DATA

[2751] Mr. Andrews' warning (see article on pp. 610-612) that the data obtained at different Reynolds numbers must not be compared, is a useful one for designers who are starting the construction of gliders without previous experience.

The conditions under which most English gliding clubs are working are not suitable for sailplanes of large span, therefore the reduced structure weight obtainable with U.S.A. 27, due to lower stalling speed and deeper rear spar, may be more important than the slight deficiency in L/D.

In glider design it is important to consider the club grounds, the altitude of which may be 2,000 ft. lower than the German grounds, the pilots have had less experience in soaring, the hangar accommodation is generally inadequate, and the club's facilities for construction far from ideal, all of which tends to subordinate aerodynamic efficiency to all-round convenience of handling and construction. The experience obtained with "Prufing" type gliders tends to confirm this point of view.

L. HOWARD FLANDERS.

London.

CIVIL AIR DISPLAYS

[2752] I was very interested in your Editorial comment for June 12, since the matter is one to which I have given a very great deal of thought.

I make it my business to attend the majority of these Air Displays, and from my observations there is not the slightest doubt that something better than the existing programmes will have to be thought out soon if the public are to be induced to retain their interest.

First of all, it seems to me that the question of aircraft demonstration will have to be tackled. At the present time there appears to be a tendency to let young R.A.F. officers have the pleasure of some free flying in return for "showing off" the machine at the meeting. Now do not let it be thought that I am in any way deprecating the flying ability of such officers, for I am not, but what I do say is that they have been brought up in an atmosphere which is antagonistic to correct demonstration, and that their flying training has given them a mentality which makes them, so often, utterly useless for such a job.

When they are given a machine the first thing they think about is throwing it about quite regardless of whether it is meant to be an aircraft particularly suitable for such manoeuvres, and all too often they come down and remark of that particular aircraft, "Oh! its no use at all, I simply couldn't roll it, and it was as much as I could do to get it on its back at all."

After hearing such remarks I often go and look at the aircraft, and as likely as not find that it is a slow, comfortable machine, built solely for those who have recently learnt to fly, and who want something simple and easy to fly from A to B, and who never have the slightest desire to put it on its back or do other such manoeuvres.



Pilot-Officer Grierson

ON June 23, Pilot-Officer John Grierson received an official communication from the Air Ministry releasing him from further service in the Royal Air Force. Mr. Grierson, it will be remembered, flew from India to England last month in a second-hand Gipsy Moth aeroplane in 4 days 12 hours 50 minutes, the quickest solo flight on record on the homeward route. On arrival here he was placed under open arrest.

The Blériot Machine at Hendon.

THE R.A.F. Display Authorities have made efforts to exhibit one or two pre-war types of aircraft at Hendon this year, and among them will be the Blériot, which was flown at Hanworth on Saturday, June 6. At Hendon it will be flown by Flt./Lt. W. E. Purdin.

N.F.S., Ltd., were responsible for finding this machine

Civil aircraft should be demonstrated as civil aircraft, and not as poor emulations of single-seater fighters. Those in charge must realise that there are small civil aircraft in this country which are built with extreme manoeuvrability as their *raison d'être*, and it is these which should be stunted to the limit, because stunting is their selling point. It is, in fact, the selling points of civil aircraft which should be demonstrated, and those in charge should make it their business to invent suitable ways of doing this.

Take as an example the Autogiro, which can land, when necessary, almost vertically. For this reason a demonstration of it should not take the form of an aerobatic display, because it is definitely not suitable for such a form of flying. It would be easy enough to bring a little light humour into it, such as pegging out a small enclosure in which an old woman was hanging up her washing; the Autogiro could then come along and land in this enclosure, showing that such small spaces can be used when necessary.

Similar schemes can be formulated for all the various aircraft at the meeting, and I cannot help thinking that the manufacturers must be considered a great deal at fault in not collaborating with their own pilots and the organisers of the display in order that the special points of their aircraft are adequately demonstrated. Naturally, as you yourselves say, an efficient announcer would have to confer with each pilot previous to his starting his show.

Another way in which I should suggest that the public could be interested in the machines would be for them to fly in them. At present there are often only Avro's available for joy-riding, whereas there ought to be at least one machine of each type. How much better it would be if there was a wide choice of aircraft, for I feel sure that then many people would want to take a flight in more than one type.

Another way in which it has always seemed to me that organisers of meetings have failed is that they have made little or no attempt to educate the public about the actual art of flying. This was done in a novel way at the last Northampton Meeting, and it is the sort of thing which should be elaborated. In that case use was made of a small wireless transmitting set in the aircraft with admirable results, but such a demonstration could be given without it, provided a prearranged programme was gone into with the announcer beforehand. I feel, however, that a better purpose would be served if the demonstrations were to take the form of killing some of the bogeys of flying. Such as, for instance, the thought which the general public have that engine stoppage inevitably means a crash. The pilot could arrange to stop his engine at some distance from the aerodrome, and show that a normal landing can be made in this way. Similarly, spins and stalled flight could be shown. I sincerely hope that you will not be letting this matter drop. It is a vital one, if public interest is to be maintained in flying meetings, and such well-informed leaders, as that referred to, will do a great deal to wake up interest in those who are responsible for the nurture of the correct public attitude toward flying.

Victoria, S.W.1.

"DAEDALUS."

for the authorities and bringing it over to England, and will also erect, and look after it, at Hendon during this Display, returning it to France directly afterwards.

It is interesting to note, by way of comparison with present-day machines, that less pilot, fuel and oil it weighs 594 lb.; has a wing span of just over 29 ft.; a wing area of 177 sq. ft.; while its full length is 26 ft.

Aviation Fuel

In a recent write-up of the baptism of the National Benzole Co.'s Puss Moth, we mentioned that this fuel had a high knock value. This should, of course, have been high anti-knock value, since the addition of benzole to an ordinary high-grade petrol materially increases its value, inasmuch as most engines using such a mixture pull better and are far less prone to "pink" or knock under heavy load.

Airism from the Four Winds

Atlantic Flights Again

THREE Atlantic flights started this week. On June 19 two Danish airmen, Capt. Holger Holris and Mr. Otto Hillig, left Hasbrouck Heights, New Jersey, in a Bellanca monoplane, for Harbour Grace, N.F., where they arrived on June 23. They left Harbour Grace on June 24 with the intention of flying to Copenhagen. The second attempt is a round-the-world effort by Mr. Wiley Post and Mr. Harold Gatty—a former Australian naval cadet—in a Lockheed Vega monoplane. They left New York early on June 23, reaching Harbour Grace nine hours later, and started for the Atlantic crossing in the evening of June 23. Their objective was Berlin, or Croydon, after which they intend to proceed via Moscow, Irkutsk, across the Behring Strait to Nome, Alaska, and Canada, back home. The third effort is that of Miss Ruth Nichols, also in a Lockheed Vega. Miss Nichols left New York for Harbour Grace on June 22, but crashed on landing at St. John, New Brunswick. She received injuries to her spine, but it is reported that her condition is not serious.

At the time of writing news was received that Mr. Post and Mr. Gatty had arrived over Bangor, North Wales, on Wednesday afternoon (June 24) and landed at Sealand Aerodrome at 12.50 p.m. After a short rest and look at the weather reports, they set off once more for Berlin.

Miss Sicele O'Brien and Mrs. Gallien Killed

It is with extreme regret that we have to announce the death, as the result of a flying accident on June 18, of Miss Sicele O'Brien and Mrs. Gordon Gallien. They had arrived at Hatfield aerodrome from Brough, in a Blackburn "Bluebird," en route for Hanworth, and had just taken-off to resume the journey, when the machine was seen to nose-dive in a spin. It crashed into a hayfield outside the aerodrome and immediately burst into flames. The machine was completely destroyed within a few minutes, and it was impossible to rescue the unfortunate occupants. The bodies were charred beyond recognition.

Missing Australian Official Found

ON June 8, Mr. J. H. Ekins, an inspector of the Australian Civil Aviation Department, disappeared in a storm while flying from Melbourne to Albury. Last week rabbit-trappers discovered the wrecked "Gipsy Moth" in rugged country near Tallarook, Vic. Search parties subsequently found the body of Mr. Ekins in the cockpit of his

machine. Apparently he had crashed into some trees, and had been killed instantly, death having been caused by head injuries.

Do.X Moves Again

THE large German flying boat Do.X, which recently succeeded in crossing the South Atlantic, flew from Natal to Bahia on June 18, and on June 20 arrived at Rio de Janeiro, where she will stay for a few weeks.

Graf Zeppelin

It now appears that the German airship *Graf Zeppelin* and Sir Hubert Wilkins's polar submarine *Nautilus* will not keep their rendezvous at the North Pole owing to the recent breakdown of the submarine. It is probable that the airship will make a flight over the Arctic regions, nevertheless. The *Graf Zeppelin* carried out an interesting experiment on June 19 in connection with the proposed polar flight, however, when she landed on the surface of Lake Constance. Descending slowly to the surface of the lake, sea anchors were lowered from the airship, followed by a water tank and inflated rubber pontoons. The airship "bounced" lightly on the latter and then came to rest. A rubber lifeboat was then lowered into the water and two members of the crew cruised about in this for some time before returning to the airship, which then rose from the lake and flew back to Friedrichshafen.

Flight-Lieut. H. M. Schofield flying again

FLIGHT-LIEUT. SCHOFIELD, who had the misfortune to crash in his Autogiro at Sherburn-in-Elmet on May 31, has now recovered, and is, we are glad to say, flying again. Everyone will be pleased to hear that there were no serious complications to his head wound and that his recovery is complete.

U.S. Aircraft Production

AEROPLANES manufactured in the United States during the first three months of 1931 totalled 672, viz., 342 for domestic civil use, 302 military planes, and 28 for export.

Roumanian Honour for Kingsford Smith

THE Congress of the International Aeronautical Federation, at its meeting at Sinaia, Roumania, has awarded its Gold Medal for 1930 to Air-Commodore Kingsford Smith for his Transatlantic flight and other air achievements.



A "DRESS" REHEARSAL: R.A.F. parachutists donning their gear before going up at Henlow to rehearse parachute jumps for the R.A.F. Display at Hendon. This event will be one of the "thrills" of the programme.

Book Reviews

"THE WAR IN THE AIR"

MR. H. A. JONES, late of No. 47 Squadron, R.A.F., who succeeded the late Sir Walter Raleigh as the official war historian of the British flying services, has now produced his second volume, which is the third of the series. It is a volume which is obviously a part of a greater whole, and is not to be considered as a separate entity. This volume consists of three parts, between which there is very little connection, and yet each deals with a subject which called for careful and separate treatment. The three subjects dealt with are the operations in East Africa, the air raids on Great Britain from 1914 to February, 1916, and the Western Front from the winter of 1916-17 to the end of the battles of Arras. These subjects are so dissimilar that, as one reads the book through, one feels that one has taken two mental jumps, each of which lands one in a world very different from that which one has left.

It is convenient to deal first with the second section of the book, that which records the air raids on Great Britain, as that occupies the bulk of the pages in the volume. It is almost entirely concerned with the raids by airships, Zeppelins and Schutte-Lanz ships. The aeroplane raids came at a later date. Mr. Jones has displayed the utmost diligence in compiling this record. He has examined with great care the raid records of both the British and the German Governments. He has traced, not only each raid, but the progress and course of each airship, and almost the result of every bomb dropped. The volume is accompanied by a special portfolio of maps, each of which shows the course of one raid and the track of each airship which took part in it. The task of making readable such a record, with its inevitable repetitions, must have taxed the author's literary ability to the utmost. Strange to say, he has succeeded in avoiding any suggestion of ennui in himself or of evoking that feeling in his readers. At the same time, one cannot help wondering if the result was worth the effort. One excuse may be that the majority of readers were not in the trenches, and the air raids were all that they actually saw of the war; therefore, they are more likely to be interested in reading about the course of an airship which dropped bombs on their own town or village, than in the progress of air fighting on one of the fronts, which they did not see. For instance, those who saw the bomb drop in front of the Lyceum Theatre on October 13, 1915, which killed 17 people and injured 21, as well as setting the wood paving of the street alight, will be interested to know that this was dropped by Zeppelin L.15, commanded by Capt. Breithaupt, and that this same airship, with the same captain in command, was hit by the Purfleet gun on April 3, 1916, and fell into the sea. Breithaupt and his crew surrendered, and were taken prisoners, but the airship sank off Westgate while being towed in. For the rest, this record may be of value for reference when questions concerning bombing are under discussion. An official record can hardly be too full of information, but, none the less, the amount of attention given to these Zeppelin raids seems somewhat disproportionate.

For the description of the operations in East Africa, we have nothing but praise. The aircraft collected for the East African field force were rather a decrepit lot, and it entailed marvels of repair work on the part of the mechanics to keep them in the air. But, as this story makes clear, they were simply invaluable to General Smuts in letting him know where the elusive German forces were. The campaign started with the destruction of the raider "Konigsberg" up the Rufiji delta, and this could hardly have been accomplished so successfully without the aid of the aircraft. In order to make clear the work which the aircraft had to do, the historian is obliged to give a good summary of the position on the ground, and this is so well done that we get from this air history a clearer bird's-eye view of the whole of this campaign than we have yet discovered in any other book.

The outline of the battles of Arras is also very clear.

"The War in the Air," Volume III. By H. A. Jones. (Oxford University Press.) Obtainable from the "FLIGHT" Offices. Price 24s. 3d. post free.

The whole situation is reviewed, including the problems of aircraft supply in Great Britain. Sir Douglas Haig was a convinced believer in the need for a large and effective air arm, and he made large demands of the Home Government, which they sometimes found it very difficult to meet. Having dealt with this necessary, though somewhat uninspiring, subject, Mr. Jones gives us an excellent appreciation of the air situation on the front. The battle of Arras opened with the R.F.C. superior to the enemy in numbers, but inferior in the quality of aeroplanes. This was the period when von Richthofen was at the height of his career, and his spirit had been infused into the whole of the German air service. The Albatros D.3 and the Halberstadt fighters were superior in performance to the British fighters. The D.H.2 and the Nieuport, which had earlier done excellent service, were now outclassed. The F.E.2D. still, on the whole, held its own in fights, but it sometimes suffered severely. The Bristol Fighter had just appeared on the scene, but at first it was not properly understood by the pilots. They thought that it was not strong enough to be thrown about, and they also had an idea that the rear gun was the best weapon for offence. Thus, the first patrol of the Bristols of No. 48 Squadron, led by Capt. Leefe Robinson, V.C., was shot to pieces by five Albatros machines, led by Richthofen himself. Still, handicapped as it was by machines which were either inferior or were suspected of inferiority, the R.F.C. kept up its deliberate policy of offence. The casualties at this period were ghastly, but General Trenchard insisted, and the pilots concurred, that a flying corps cannot do its duty by the Army unless it persists in offensive operations. Richthofen might shoot down numbers of them, but, so long as the flying was all on the German side of the lines, then our Army would get more information about the German positions than the enemy would get about ours.

Relief came when some R.N.A.S. squadrons brought over the Sopwith "Pup" and the Sopwith Triplane. These could fight the Albatros and the Halberstadt on equal terms. Then our pilots learnt how to use the Bristol Fighter, and it began to work havoc among the German machines. The German fighter pilots, fewer in numbers than ours, began to show signs of weariness, and Manfred von Richthofen himself was sent on leave to get a little rest. In his absence a certain slackening of the German air effort was noticed, and our men took advantage of it. We were developing formation fighting, though Ball and Bishop mostly worked alone as they piled up their totals of German machines shot down. Ball, flying a Nieuport, was killed in combat, but Lothar von Richthofen (acting as squadron commander in the absence of his elder brother) was wounded in the same fight. Then the S.E.5 and the D.H.4 began to arrive at the front, and the R.F.C. began to establish a superiority in the air which caused the German authorities to cancel the rest of Manfred von Richthofen's leave and bring him back to the front. His return was marked by the appearance of what we should now call fighter wings, but what were dubbed by the R.F.C. pilots as "Circuses."

This description of how the fortunes of the air fight swayed to and fro as first the Germans and then the British designers produced better aeroplanes is a particularly valuable part of this book. It is admitted that the British and the German pilots were equal in skill and in courage. Their tactics were different, for the Germans apparently believed in fighting behind their own lines, while we persisted that the lines must be crossed. But the success of the fighting through any one period depended upon which side had machines with the greatest amount of speed, climb, and manoeuvrability, combined with facilities for getting the guns into action. The introduction of the Constantinesco gear gave a great help to the British, for the Germans had long before been able to fire through their propellers. It is, in fact, to be regretted that still more of this book is not devoted to the battle between the designers of the two nations, with more details of how one machine outclassed its rival, and in turn was itself outclassed by something new. Perhaps Mr. Jones will devote more attention to this subject in his next volume.

F. A. DE V. R.

GLIDERS AND GLIDING

By W. R. ANDREWS, F.R.Ae.S.

WITH the growth of the present gliding movement, the time will come when the more enthusiastic members will be contemplating the design, as well as the construction of their own craft.

The present article is written to assist the would-be designer to discover for himself the characteristics of any particular design of wing system.

A method is also outlined whereby the best air speed for various conditions, met with in soaring flight, may be calculated.

The formula and data are presented in a form readily used by anyone with an elementary mathematical knowledge, without need of reference to any outside work.

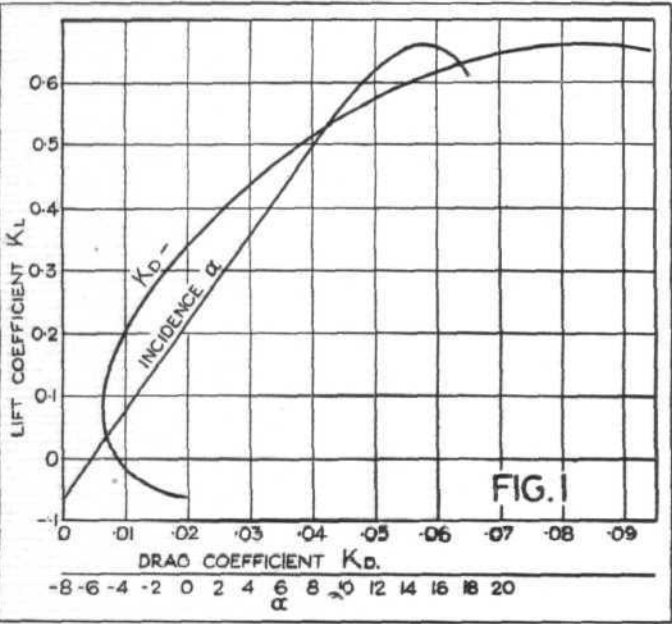
In an article entitled "The Flight Conditions of Gliders" (FLIGHT, January 9, 1931), Mr. Howard Flanders discussed the problem of high speed and high angle gliding, but mainly on the points of structural strength and load factors.

Mr. Flanders has greatly narrowed the field of investigations by informing us that the German experts use Göttingen Section No. 549 for the wings of their gliders.

There is no reason, of course, why this section should be taken as the correct one to use, but until concrete evidence is available to show the superiority of any other section, one would be unwise to make a change.

A word or two of warning to those who may wish to try out other sections may not be out of place at this juncture.

When comparing the wind-tunnel tests of various sections,



Aerofoil characteristics of Göttingen 549. Aspect ratio, 5; wing speed, 98.4 ft. per second.

too strict comparisons should not be made between sections tested in different wind tunnels.

Always make sure that sections to be compared are tested at the same "Aspect Ratio," and also at approximately the same wind speed.

It is not safe to compare the results of tests in the Variable Density Tunnel of the Langley Memorial Aeronautical Laboratory with test results from any tunnel working at atmospheric pressure.

The test results from any particular tunnel can be taken as being comparable, especially where sections of similar thickness are being investigated.

Mr. Flanders, in his article, suggests the use of U.S.A. 27 Section as giving deeper spars than the Göttingen 549 Section. He also comes to the conclusion that the U.S.A. 27 section is the more efficient of the two.

Exactly on what grounds Mr. Flanders bases his decision does not seem clear, but apparently he obtains a higher nose-dive speed with the U.S.A. Section.

Perhaps Mr. Flanders is not aware that the U.S.A. 27 Section has been tested in the Göttingen tunnel, under the name of Göttingen 509. (See N.A.C.A. 331.)

The U.S.A. 27 Section has also been tested in the Variable Density Tunnel, and it would seem that this is the test used by Mr. Flanders when making his calculations.

A comparison of the two tests on the American section will show something of the difference to be expected between the tests in one tunnel and those on the same sections carried out in a different tunnel. (See Fig. 4.)

From the Göttingen tests, the profile drag of the U.S.A. 27 Section is much greater than that of Göttingen 549 section.

The Variable Density Tunnel tests show the U.S.A. 27 section superior to Göttingen 549 section at small values of lift only, that is, close to the nose-diving condition.

Had the Göttingen 549 section been tested at high pressure, it is possible that a similar reduction in profile drag at small lift values would have obtained.

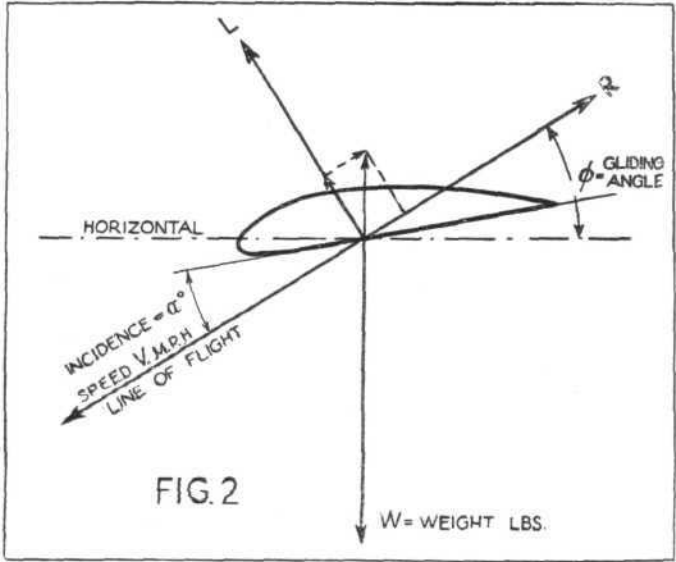
In the region of the minimum rate of descent (K_L about 0.4), the U.S.A. section has greater drag than the Göttingen 549 section, and cannot be claimed as superior for gliding purposes.

Even at the risk of labouring the point, the writer would impress upon would-be glider designers the necessity of examining very carefully all the evidence before a change of wing section is decided upon.

For the purpose of this article, the Göttingen 549 section will be used throughout.

The wing characteristics in Fig. 1 are copied as accurately as possible from N.A.C.A. Report No. 286.

The test was carried out at Göttingen on a model 39.37 in. \times 7.874 in., and at a wind speed of 98.4 ft. per second.



Gliding flight.

The "aspect ratio" of the tested wing is 5, where "aspect ratio" is understood to be

Aspect ratio = $A = \frac{\text{Span}^2}{\text{Area}} = \frac{S^2}{S_w}$ (1)

For a rectangular wing this reduces to span/chord, but as equation 1 applies to any shape of wing it is as well to think of aspect ratio in that form.

The lift experienced by the wing due to its passage through the air at an angle to the wind is expressed in terms of a coefficient K_L , such that

Lift = $L \text{ (lb.)} = \frac{K_L \cdot S_w \cdot V^2}{195.5\sigma}$ (2)

where S_w = wing area in square feet.

V = speed in line of flight miles per hour.

σ = Relative density, for use only at altitudes.

195.5 = A constant which is built up by the reciprocal of the standard density and the conversion factor from miles per hour to feet per second.

The formula for lift has been kept in the simplest form so as to confuse as little as possible those who are new to the terms and expressions.

The drag of a wing is given by a very similar expression to (2), which is

$$D \text{ lb.} = K_D \cdot \frac{S_w \cdot V^2}{195 \cdot 5}$$

where K_D is the drag coefficient,
The lift of a wing acts at right angles to the wind direction, or line of flight measured relative to the chord of the wing. This is illustrated in Fig. 2.
The drag acts in opposition to motion in the line of flight.
The angle made between the line of flight and the chord of the wing is called the "Angle of Incidence" = α .
The point through which the drag and the lift act is called the "C.P." or centre of pressure.
The C.P. is always on the chord line of the wing, but not necessarily on the wing itself.
As the movement of the C.P. during flight has no very great effect on the aerodynamic properties as far as gliding is

easily be found, provided the plan form is either rectangular or elliptical.
The case of a tapered wing is more involved, but if the tip chord is from 0.4 to 0.6 of the chord of the centre portion, no great error is introduced by treating it as of an elliptical plan form.
The correction from the infinite wing to any other aspect ratio takes the form of
$$K_D = K_{D_p} + \Delta K_D \dots\dots\dots (4)$$
$$\alpha = \alpha_o + \Delta \alpha \dots\dots\dots (5)$$
where K_{D_p} and α_o refer to the infinite wing and K_D and α to a wing of aspect ratio A.
The numerical values of ΔK_D and $\Delta \alpha$ are obtained as follows :—

(a) For rectangular plan form of wing—

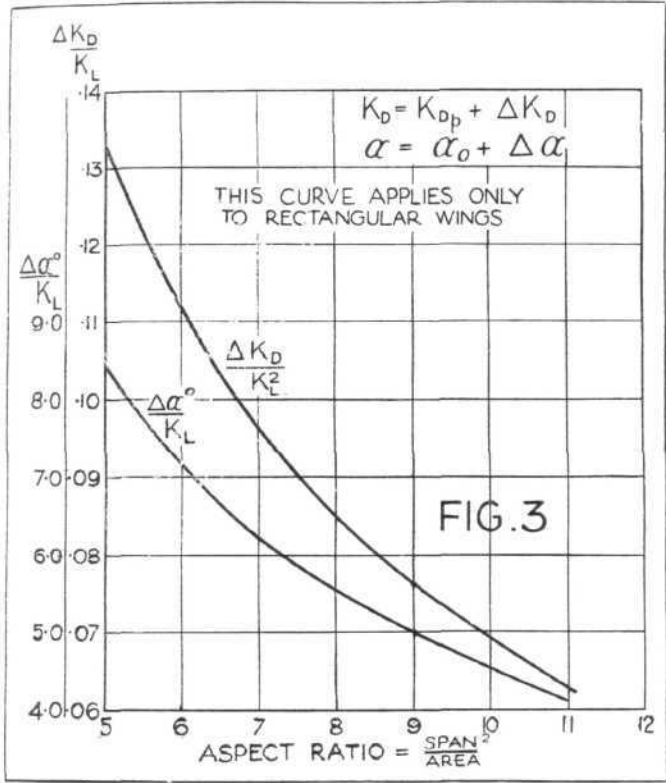
$$\Delta K_D = \frac{\Delta K_D}{K_L^2} (\text{from Fig. 3}) \times K_L^2 \dots\dots\dots (6)$$

$$\Delta \alpha = \frac{\Delta \alpha}{K_L} (\text{from Fig. 3}) \times K_L^0 \dots\dots\dots (7)$$

(b) For elliptical plan form of wing—

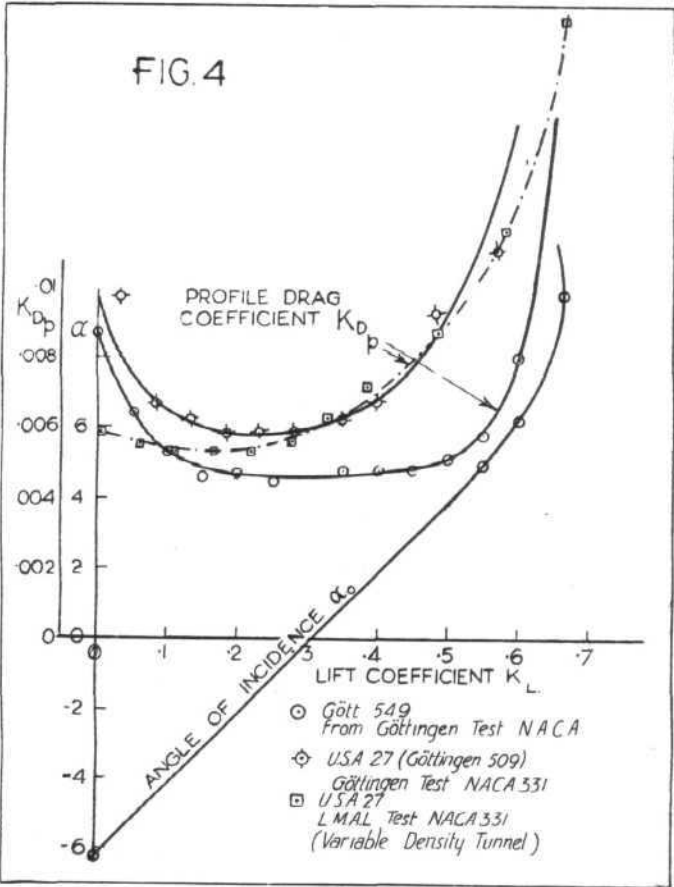
$$\Delta K_D = \frac{2}{\pi \cdot A} K_L^2$$
$$= \frac{0.636}{A} K_L^2 \dots\dots\dots (8)$$

$$\Delta \alpha = \frac{2 \times 57.3}{\pi \cdot A} K_L \text{ degrees}$$
$$= \frac{36.5}{A} K_L \dots\dots\dots (9)$$



Correction to drag coefficient and incidence for aspect ratio.

concerned, it has been omitted from all diagrams and calculations for the sake of simplicity.
The main features of a wing have now been simply explained and return can be made to the wing characteristics plotted on Fig. 1.
The aspect ratio is very carefully marked on the characteristic curve, as with a change of aspect ratio there is a change of characteristics. In other words, the characteristics shown in Fig. 1 do not refer to any but wings of aspect ratio of 5.
Broadly speaking, the effect of aspect ratio may be explained, as follows :—
The main loss in efficiency of a wing is due to the loss of lift at the tips caused by the air flowing outwards from under the wing and in over the top of the wing.
If now the chord of any wing is kept constant and the span is increased, the tips are then farther apart and the centre portion of the wing is less affected by the action of the air at the tips than was the case of the shorter span.
As the span is further increased the loss of lift due to the tip effect becomes a less proportion of the total lift.
The ideal wing is one having no ends, the span stretching away to infinity in both directions. Such a hypothetical wing is known as having an "infinite aspect ratio."
Theory has shown that the characteristics of such a wing can be calculated from the tests on a wing of finite dimensions.
Provided the plan form of the tested wing is either rectangular or elliptical, the correction to the infinite aspect ratio is a simple matter.
Having once obtained the characteristic of this infinite wing, the characteristics of a wing of any aspect ratio can



Aerofoil characteristics of Göttingen 549 at infinite aspect ratio.

For example, in a rectangular wing the change of characteristics for a change of aspect ratio from infinity to 5 is as follows :—
$$\Delta \alpha_o = 8.45 K_L (\text{from Fig. 3}) \dots\dots\dots (10)$$
$$\Delta K_{D_p} = 0.1326 K_L^2 (\text{from Fig. 3}) \dots\dots\dots (11)$$
If, now, these quantities are deducted from the characteristics for aspect ratio 5 in Fig. 1, we get those for the infinite aspect ratio shown in Fig. 4.

By the aid of equations 6, 7, 8 and 9, and Figs. 3 and 4, the characteristics of any wing of approximately rectangular or elliptical plan form (without twist) can be obtained.

Having now our wing characteristics, we can proceed to examine how they are utilised to find the speeds, gliding angles, and rates of descent of a full-scale craft.

Reference to Fig. 2 will show that for steady flight conditions the weight of the glider must be balanced by components of lift and drag.

Since the lift and the drag act at right angles to one another, their resultant is given by $\sqrt{R^2 + L^2}$, but for glides not steeper than 1 in 11 or 12 this quantity is very nearly the same as L , and will be taken as such.

So that from equation 2 we can write

$$W = \frac{K_L S_w V^2}{195.5} \quad (12)$$

for ground level conditions.

From considerations of elementary trigonometry, it is obvious from Fig. 2 that the angle of glide is given by:—

$$\tan \phi = \frac{R}{L} \quad (13)$$

or the glide is on a gradient of

$$\text{Gliding angle} = 1 \text{ in } \frac{L}{R} \quad (14)$$

Substituting for L and R from equations 2 and 3 gives:—

$$\text{Gliding angle} = 1 \text{ in } \frac{K_L}{K_R} \quad (15)$$

where K_R is the wing drag coefficient plus the coefficient of body drag; in other words, K_R is the overall drag coefficient and R the overall drag.

The rate at which the glider would descend in free air is given by the speed divided by the gradient of the glide, i.e., if v = downward speed in f.p.s.—

$$v = \frac{V \text{ f.p.s.}}{K_L/K_R}$$

or if V is in m.p.h.

$$v \text{ f.p.s.} = \frac{1.467 V \text{ m.p.h.}}{K_L/K_R} \quad (16)$$

At some speed the rate of descent becomes a minimum, and when flying at this air speed the greatest advantage is taken of any upward current in the atmosphere.

The presence of an upward current of air of any speed does not affect the speed at which this minimum rate of descent occurs.

Where it is necessary to go from one point in the air to another with the least loss of height, flight is made on the smallest angle of glide or the speed corresponding to maximum value of K_L/K_R .

If flight is to be made from some point in the atmosphere to some distant point on the ground, the conditions are different and changeable, depending on the direction and strength of the wind.

For flights from one cloud to another, the best results would be obtained at the minimum gliding angle; that is, at the speed where K_L/K_R is a maximum.

Perhaps a numerical example will clear up any little points of doubt in the reader's mind.

Take the case of a glider having the following particulars:—

Span: 50 ft.

Wing area: 250 sq. ft.

Plan form: Elliptical.

Wing section: Göttingen 549.

Weight fully loaded: 500 lb.

Assume that the drag of the fuselage and tail unit is 40 lbs. at 100 m.p.h.

1. The Wing Characteristics.

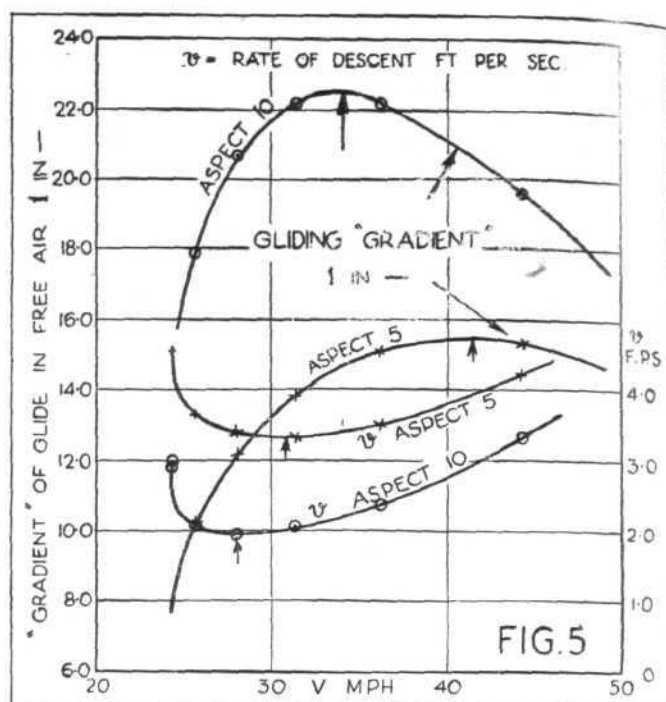
From equation 1:—

$$\text{Aspect ratio} = A = \frac{S^2}{S_w} = \frac{50^2}{250} = 10.$$

from equation 8

$$\begin{aligned} \Delta K_D &= \frac{0.636}{10} K_L^2 \\ &= 0.0636 K_L^2 \end{aligned}$$

$$\therefore K_D = K_{D_p} \text{ (from Fig. 3) } + 0.0636 K_L^2$$



Gliding flight in still air.

From equation 9

$$\begin{aligned} \Delta \alpha &= \frac{36.5}{A} K_L = \frac{36.5}{10} K_L \\ &= 3.65 K_L \end{aligned}$$

$$\therefore \alpha = \alpha_0 \text{ (from Fig. 3) } + 3.65 K_L$$

2. Body Drag Coefficient.

Equation similar to that for drag is:—

$$\text{Body drag} = K_B \cdot \frac{S_w V^2}{195.5} = 40 \text{ lb. at } 100 \text{ m.p.h.}$$

$$\therefore K_B = \text{Body drag} \div \frac{S_w V^2}{195.5}$$

$$= 40 \div \frac{250 \times 100^2}{195.5}$$

$$= 0.00313$$

$$\therefore K_R = K_{D_p} + 0.00313 + 0.0636 K_L^2$$

Gliding Flight at Ground Level. $A = 10.0$.

Choose K_L	=	0.1	0.2	0.3	0.4, etc.
K_{D_p} (Fig. 3) + 0.00313	=	0.00843	0.00778	0.00773	0.00786
$\Delta K_D = 0.0636 K_L^2$	=	0.00064	0.00254	0.00572	0.01018
$K_R = \text{Sum}$	=	0.00907	0.01032	0.01345	0.01804
$V = \sqrt{\frac{195.5 W}{S_w K_L}} \text{ m.p.h.}$	=				
$= \sqrt{\frac{195.5}{K_L}}$	=	62.5	44.2	36.1	31.3
Gliding gradient 1 in $\frac{L}{K_R}$	=	11.0	19.4	22.3	22.0
Rate of descent $= 1.467 \cdot \frac{V K_R}{K_L}$	=	8.33	3.34	2.37	2.07

The complete results are plotted in Fig. 5.

The points of minimum rates of descent and minimum gliding angle are marked.

The corresponding curves for a similar glider, but having an aspect ratio of wing of 5 is also given for comparison.

The difference in the gliding angle and the speed of descent clearly shows why the sail plane has to have such a large aspect ratio.

The differences noted in Fig. 5 are due solely to the effect of aspect ratio, the wing area, the weight and the body drag are the same in both cases.

THE ROYAL AIR FORCE

London Gazette, June 16, 1931.

General Duties Branch

Air Commodore F. W. Bowhill, C.M.G., D.S.O., relinquishes the appointment of Director of Organisation and Staff Duties, Air Ministry (May 4); Pilot Officer on probation H. V. Satterly is confirmed in rank (May 19). The follg. Pilot Officers are promoted to rank of Flying Officer:—C. F. G. Adye (April 11); L. W. C. Bower (June 14).

Group Captain A. C. Winter, O.B.E., is placed on half-pay list, scale "A" (June 6); Flying Officer A. A. Leslie is transferred to Reserve, Class A (June 13); Wing Commander G. B. Hynes, D.S.O., is granted permission to retain rank of Group Captain on retirement on account of ill-health (April 12); Flying Officer R. W. Letchworth resigns his permanent commn. (June 17); the short-service commn. of Pilot Officer on probation R. C. D. Makins is terminated on cessation of duty (June 17); Lt. G. H. Birley, R.N., Flying Officer, R.A.F., relinquishes his temp. commn. on return to Naval duty (April 8, 1930) (substituted for *Gazette*, April 22, 1930).

Accountant Branch

The follg. Pilot Officers on probation are confirmed in rank and promoted to rank of Flying Officer (June 2): D. Lungair, C. G. Sharp, J. G. Wigley.

Medical Branch

E. A. Gudgeon, M.R.C.S., L.R.C.P., is granted a short-service commn. as Flying Officer for three years on Active List with effect from 1st June and with seny. of June 1.

Princess Mary's Royal Air Force Nursing Service

Sister Miss E. L. Whittingham is placed on retired list (June 15).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The follg. Pilot Officers on probation are confirmed in rank:—C. W. J. Allen (March 6); I. R. Scott (May 13). The follg. are granted commns. in Class AA (ii) as Pilot Officers on probation:—H. J. Greenland (June 1); C. D. Whittingham (June 2).

Flight-Lt. A. M. Blake, A.F.C., is transferred from Class C to Class A, (March 23). The follg. Flying Officers relinquish their commns. on completion of service:—L. F. Mead (April 20); E. O. Fuller (May 1); J. C. Raine, M.B.E. (May 8).

Gazette, April 21, concerning Flying Officer P. Christopherson is cancelled. *Gazette*, May 19, concerning Flying Officer H. M. Gibbs is cancelled. The commn. of Pilot Officer on probation G. M. E. Speedy is terminated on cessation of duty (May 22).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Squadron Leaders: J. V. Read, M.B.E., to R.A.F. Depot, Uxbridge; 25.5.31. C. R. Davidson, M.C., to H.Q., R.A.F., Transjordan and Palestine-Jerusalem, 5.6.31.

Flight Lieutenant W. J. Millen, to H.Q., Inland Area, Stanmore, 21.5.31.

Flying Officers: D. J. Waghorn, to R.A.F. Base, Gosport, 18.6.31. G. L. G. Richmond, to No. 22 Sqdn., Martlesham Heath, 18.6.31. G. C. Holland, to No. 24 Sqdn., Northolt, 10.6.31. K. C. T. Marshall, to R. A. F. Base, Gosport, 8.6.31.

Pilot Officers: W. E. Rankin, to No. 12 Sqdn., Andover, 11.6.31. B. C. Pocock, to No. 4 Flying Training School, Abu Sueir, Egypt, on appointment to a short service commn., 1.6.31.

Stores Branch

Pilot Officer: J. E. Shrimpton, to Home Aircraft Depot, Henlow, 12.6.31.

Medical Branch

Flight Lieutenant S. B. S. Smith, to No. 4 Flying Training School, Abu Sueir, Egypt, 15.5.31.

Flying Officers: E. Corner, to No. 5 Sqdn., Quetta, India, 15.5.31. E. A. Gudgeon, to Medical Training Depot, Halton, on appointment to a short service commn., 1.6.31.

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty:—**Lieuts. (F./O. R.A.F.).**—A. Brock, to *Courageous*, for F.F.D. in 402 Flt. (July 7); S. Borrett, to *Centaur*; and C. L. Keighly-Peach, to *Victory* for F.F.D. in 402 Flt. (July 25). O. S. Stevinson, to *Courageous* (July 25); E. H. Shattock, to *Courageous* (July 25); and C. A. Kingsley-Rowe, to *Victory*.

AIR MINISTRY NOTICES

AIR MINISTRY NOTICES to Airmen and to Ground Engineers are now sub-divided in the manner, which was explained in *FLIGHT* for April 17. In view of this rearrangement and also of the increasing size of these notices, these in the future will be published in *FLIGHT* in summarised form only. Readers will thereby be enabled to see readily what each notice is about and if they should desire to do so, to obtain copies of the particular notices which interest them, from the Secretary, Air Ministry, Gwydyr House, Whitehall, London, S.W.1, or from the Automobile Association, Fanum House, New Coventry Street, W.1.; the Royal Aero Club of the United Kingdom, 3, Clifford Street, W.1.; National Flying Services, Ltd., Hanworth Park, Middlesex.

NOTICES TO AIRMEN, SERIES A.

No. 22 of 1931. London-Continental Air Routes: Position Reports by Radio Telephony during Bad Visibility. (88553/31.)

This is a notification that pilots flying on London-Continental air routes and reporting their position to Croydon by wireless telephony under conditions of bad visibility should state their altitude above sea level and whether they are flying above, below or in the cloud.

No. 24 of 1931. Reporting of destination on departure from civil aerodromes. (111613/31.)

CANCELLING Notice No. 75 of 1928 (reprint No. 12) in General Notice No. 1 of 1930, this draws attention to the necessity of pilots of aircraft flying from Great Britain to Northern Ireland from abroad notifying their destination, and also the station at which they intend alighting for Custom examination.

No. 26 of 1931. Liability for Loss, Damage or Injury at Royal Air Force Stations. (2193/30.)

The disclaimer of liability which is published as paragraph 48 of the *Air Pilot*, Vol. I, is applicable not only in connection with the use of State-owned aircraft in Great Britain and Northern Ireland, but also in connection with the use of Royal Air Force stations abroad. This disclaimer says that the Air Council, its servants or agents or agents of the Crown will not accept responsibility for loss or damage from any cause whatsoever to aircraft, goods, articles, passengers or other persons landed, accommodated at or departing from any such station.

No. 27 of 1931. Wireless Communication: Reduction of Congestion on the 900-metre Aircraft Wave. (866194/28.)

In order to reduce congestion on the 900-metre aircraft wave, pilots of aircraft shall not:—

- (a) Report their position except when passing specified reporting points or in need of assistance.
- (b) Ask the ground station for the wave length of transmission from his aircraft.
- (c) Ask the ground station for the time of his departure from that particular aerodrome.

No. 28 of 1931. Dangerous or Unsafe Flying over Populous Areas (113155/31.)

This draws attention to the provisions of Article 9 (1) and (2) of the A.N. (Consolidation) Order, 1923, which states that no aircraft shall fly over cities or towns in Great Britain and Northern Ireland, except at an altitude which will enable them to land outside the town in the case of forced landing. This does not, however, apply to within a radius of one mile from any aerodrome. Aircraft are not allowed to carry out trick or exhibition flying over any such areas nor over any regatta race meeting, or may for public games or sports, except where specially arranged for in writing by the promoters nor fly at such a low altitude or proximity to persons or dwellings as to cause unnecessary danger.

No. 29 of 1931. Visits to the Air Ministry in connection with Licences or certificates. (54502/30.)

Visits to the Air Ministry (C.A. 2), Gwydyr House, Whitehall, in connection with the issue, renewal or endorsement of licences and certificates should be made on Monday-Friday, between 11 a.m. and 4 p.m., and on Saturday between 11 a.m. and 12 noon. Special appointments are required for other times.

No. 30 of 1931. The "Safety" Signal. (884260/28.)

The amplification of paragraph 17D of Schedule 4 to the Air Navigation (Consolidation) Order, 1923, which says:—

- (1) Messages concerning the safety of navigation or urgent meteorological information should be prefixed by the safety signal consisting of (a) in radio telephony the French word "securite," repeated three times, followed by the name of the transmitting station.
- (2) In the aircraft service, both the safety signal and the 333 Rc/s. (900 m.).
- (3) All aircraft and stations hearing such a signal should cease transmitting until it has been seen.

No. 33 of 1931. Night Flying without Navigation Lights. (84095/31.)

R.A.F. aircraft will be flying over the following areas without exhibiting navigation lights unless other aircraft are observed in the vicinity.

- (1) An area bounded by Stowmarket, Tenterden, Petersfield, Newbury, and Stowmarket daily, Sundays excepted until October 30, between 19.00 and 00.45 hours. Above 3,000 ft., except a portion of that area lying between straight lines joining Croydon and Deal and Croydon and Dungeness, also between lines joining Chelmsford, where the altitude will be above 5,000 ft. on certain dates to be notified later, the altitude will be below 5,000 ft. over the area bounded by Chelmsford, Southend-on-Sea, Dartford, Waltham Abbey, and Chelmsford.
- (2) Until September 6, between 2000 and 2400 hours above 3,000 ft. in the area Stert Point, Watchet, Minehead, and Stert Point.

No. 34 of 1931. Dual Controls in Passenger-Carrying Aircraft: Safety Precautions. (113156/31.)

Pilots using aircraft fitted with dual controls are, when carrying passengers other than pupils, required to take effective precautions to prevent accidental interference of the controls by the passenger.

No. 35 of 1931. Accidental Ignition of Holt Flares. (113153/31.)

In order to prevent the accidental ignition of Holt Flares, it is advised that both leads to the flares should be disconnected before the aircraft are placed in the hangar.

AIRCRAFT COMPANIES' STOCKS AND SHARES

THE market for industrial shares has shown an improving tendency during June, and at the time of writing a fairly general marking-up of prices is in progress on the hope that the war debt moratorium proposals will make for some improvement in general trade conditions. The shares of aircraft and allied companies have made a mixed showing for the greater part of the month, but eventually movements were in favour of holders in sympathy with the more buoyant market conditions. Fairey Aviation ordinary have, perhaps, been an outstanding feature of strength with a rise from 11s. 6d. to 13s. 6d. A better demand for the shares is reported and market men attribute the recovery in the price to the fact that a former large American holding which had been overhanging the London market has now gone into strong hands. Handley Page participating preference have held their price well on the attention which has been drawn to the statements at last month's meeting. On balance, De Havilland ordinary have declined by 2s., but the greater part of the previous month's rise has been retained. Imperial Airways ordinary were at one time down to 12s. 9d., the lowest price so far recorded this year. This may be explained by the falling-off in the demand for the shares; the tendency at the present time is to value shares strictly on the basis of dividend yield. On the basis of the last annual dividend of 5 per cent. Imperial Airways ordinary yield about $7\frac{1}{2}$ per cent., which is the return now given by a large number of leading industrial shares. The fall in Ford Motor shares is probably explained by a similar reason. During the month the latter have touched their lowest price since the beginning of the year and are now quoted at 48s. 9d. as against 53s. 9d. a month ago. D. Napier ordinary have remained a very quiet market; the quotation is practically unchanged on

Name.	Class.	Nominal Amount of Share.	Last Annual Dividend.	Current Week's Quotation.
Anglo-American Oil ..	Deb.	Stk.	5/-	101½
Armstrong Siddeley Develop. ..	Cum. Pref.	£1	6½	15/-
Birmingham Aluminium Castg. ..	Ord.	£1	7½	17/6
Booth (James), 1915 ..	Ord.	£1	15	37/6
Do. do. ..	Cum. Pref.	£1	7	22/6
British Aluminium ..	Ord.	£1	10	25/-
Do. do. ..	Cum. Pref.	£1	6	19/3
British Celanese ..	Ord.	10/-	Nil	4/-
British Oxygen ..	Ord.	£1	8s	12/6
Do. do. ..	Cum. Pref.	£1	A	21/-
British Piston Ring ..	Ord.	£1	22½	28/9
British Thomson-Houston ..	Cum. Pref.	£1	7	23/6
Brown Brothers ..	Ord.	£1	10	21/9
Do. do. ..	Cum. Pref.	£1	7½	22/-
Dick (W. B.) ..	Cum. Pref.	£10	5	120/-
De Havilland Aircraft ..	Ord.	£1	5	19/-
Dunlop Rubber ..	Ord.	c	6	17/10½
Do. do. ..	"C" Cum. Pref.	16/-	10	15/1½
En-Tout-Cas (Syston) ..	Def. Ord.	1/-	Nil	1/-
Do. do. ..	Ptg. Pfd. Ord.	5/-	8	3/9
Fairey Aviation ..	Ord.	10/-	7*	13/6
Do. do. ..	1st. Mt. Deb.	Stk.	8	106½
Firth (T) & John Brown ..	Cum. Pref.	£1	6D	9/6
Do. do. ..	Cum. Pref.	£1	5*D	11/-
Ford Motor (England) ..	Ord.	£1	10	48/9
Fox (Samuel) ..	Mt. Ptual.	Stk.	5	72½
Goodyear Tyre & Rubber ..	Deb.	Stk.	6½	101½
Handley Page ..	Ptg. Pref.	8/-	12½	10/6
Hoffmann Manufacturing ..	Ord.	£1	Nil	18/9
Do. do. ..	Cum. Pref.	£1	7½	15/7½
Imperial Airways ..	Ord.	£1	5	13/-
Kayser, Ellison ..	Ord.	£5	6	50/-
Do. do. ..	Cum. Pref.	£5	6	77/6
Lucas (Joseph) ..	Ord.	£1	25	61/6
Napier (D.), & Son ..	Ord.	5/-	15	6/10½
Do. do. ..	Cum. Pref.	£1	7½	25/-
Do. do. ..	Pref.	£1	8	22/-
National Flying Services ..	Ord.	2/-	Nil	-/6
Petters ..	Ord.	£1	7	21/-
Do. do. ..	Cum. Pref.	£1	7½	17/10½
Roe (A. V.) (Cont. by Armstrong Siddeley Devel., q.v.)	Ord.	£1	—	—
Rolls-Royce ..	Ord.	£1	10	30/6
Smith (S.) & Sons (M.A.) ..	Def. Ord.	1/-	18½	1/-
Do. do. ..	Ptg. Pfd. Ord.	£1	12½	12/10½
Do. do. ..	Cum. Pref.	£1	7½	16/9
Serck Radiators ..	Ord.	£1	17½	33/6
"Shell" Transport & Trading ..	Ord.	£1	17½*	52/6
Do. do. ..	Cum. Pref.	£10	5	£10
Triplex Safety Glass ..	Ord.	£1	5	25/-
Vickers ..	Ord.	6/8	8	6/10½
Do. do. ..	Cum. Pref.	£1	5*	17/6
Vickers Aviation (Cont. by Vickers, q.v.) ..	—	—	—	—
Westland Aircraft (Branch of Petters, q.v.) ..	—	—	—	—
Whitehall Electric Investmts. ..	Cum. Pref.	£1	7½	24/6

A Issued in January.

B Rate per annum for nine months.

c £1 unit of stock.

* Dividend paid tax free.

D Last xd. on March 19.

balance. The $7\frac{1}{2}$ per cent. preference have moved up; the half-yearly dividend on these shares falls to be paid on June 30. Little business has passed in Petters ordinary pending the issue of the report which is due shortly. Dealings have taken place in National Flying Services ordinary at 6d. and 4½d. Vickers ordinary are a shade higher. In other directions, Dunlop Rubber ordinary have been in little demand in their new form; "Shell" ordinary have rallied in common with other leading oil shares; Triplex Safety Glass ordinary have made some recovery aided by market talk of the possibility of a larger dividend. Other movements call for little comment.

PUBLICATIONS RECEIVED

Flying as a Career. By Major O. Stewart. London: Sir Isaac Pitman & Sons, Ltd. Price, 3s. 6d. net.

Droit Aérien. January, February, March, 1931. Droit Aérien, 4 bis, Rue des Ecoles, Paris.

Aeronautical Research Committee Reports and Memoranda: No. 1364 (Ae.492-T.3030). The 5-ft. Open Jet Wind Tunnel, R.A.E. By F. B. Bradfield. November, 1930. Price 1s. net. H.M. Stationery Office, London, W.C.2.

International Control of Aviation. By K. W. Colegrove. World Peace Foundation, Boston, Mass., U.S.A. Price \$2.50 net.

Lang's Monthly. May, 1931. R. T. Lang, Sells, Ltd., 168-7, Fleet Street, London, E.C.4.

U.S. National Advisory Committee for Aeronautics Reports: No. 368. A New Chart for Estimating the Absolute Ceiling of an Airplane. By W. S. Diehl. Price 10 cents. *No. 369. Manœuvrability Investigation of the F6C-3 Airplane, with Special Flight Instruments.* By C. H. Dearborn and H. W. Kirschbaum. Price 15 cents. *No. 370. Effect of Variation of Chord and Span of Ailerons on Hinge Moments at Several Angles of Pitch.* By B. H. Monish. Price 10 cents. *No. 372. The Gaseous Explosive Reaction—The Effect of Pressure on the Rate of Propagation of the Reaction Zone and upon the Rate of Molecular Transformation.* By F. W. Stevens. Price 15 cents. *No. 373. Coefficients of Discharge of Fuel Injection Nozzles for Compression-Ignition Engines.* By A. G. Gellales. Price 10 cents. *No. 376. Some Approximate Equations for the Standard Atmosphere.* By W. S. Diehl. Price 10 cents. Superintendent of Documents, Washington, D.C., U.S.A.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1929

Published June 25, 1931

35,243. BRITISH THOMSON-HOUSTON CO., LTD. Means for determining altitude from aircraft. (349,426.)

APPLIED FOR IN 1930

Published June 25, 1931

1,587. H. and M. FARMAN. Driving-arrangement for rotary super-chargers for aircraft i.c. engines. (349,438.)

22,662. ECLIPSE AVIATION CORPORATION. Engine-starting mechanism. (349,835.)

28,640. I. MAKHONINE. Flying machines having supporting surfaces of variable area. (349,879.)

37,001. H. JUNKERS. Aircraft driven by engines with opposed pistons. (349,895.)

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